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THE

MORBID ANATOMY

OF THE

BRAIN.

BY

ALEXANDER MONRO, M.D.

HONORARY MEMBER OF THE ROYAL PHYSICAL, AND MEMBER OF THE MEDICO-CHIRURGICAL SOCIETIES OF EDINBURGH;

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VOL. I.—HYDROCEPHALUS.

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TO

SIR JAMES McGRIGOR, M. D.

F. R. S. L. & E. K. T. S.

LORD RECTOR OF MARISCHAL COLLEGE, ABERDEEN,

DIRECTOR-GENERAL OF THE ARMY MEDICAL DEPARTMENT,

&c. &c. &c.

WHO,

BY HIS EXAMPLE, PRECEPTS, AND THE ESTABLISHMENT

OF A MUSEUM AT CHATHAM,

HAS SO LARGELY CONTRIBUTED TO THE ADVANCEMENT

OF MORBID ANATOMY,

THIS VOLUME

IS MOST RESPECTFULLY INSCRIBED

BY HIS SINCERE FRIEND

THE AUTHOR.

PREFATORY REMARKS.

THE importance of the study of Morbid Anatomy to the accurate knowledge of Physic and Surgery, must be obvious even to the cursory and inexperienced inquirer. It may, indeed, be represented as one of the primary foundations of Medical Science; for without an intimate acquaintance with the morbid changes that take place in the human frame as the causes or the effects of disease, the Practice of Physic and Surgery can be directed only by ill-founded hypothesis or blind empiricism.

The approbation bestowed by the most competent judges upon my Work on the Morbid Anatomy of the Gullet, Stomach, and Intestines, has induced me again to become an Author, and to publish the results of my investigations into

the Morbid Anatomy of the Brain, and the various diseases originating from that source.

Some branches of Morbid Anatomy have been cultivated with much more success than others, as those pertaining to the diseases of the Chest and Belly; whereas the Morbid Anatomy of the Brain is still involved in a certain degree of obscurity: Because diseases originating from such a source depend upon a deranged state of the functions of the Brain, some of which have hitherto been imperfectly ascertained,—upon the quantity and quality of the Blood sent to the Brain, or on rupture of the Blood-vessels within the Head; and also on other causes compressing the Brain, to which are to be added, the effects of concussion, of sympathy, hunger, cold, of mental or corporeal stimuli, and of irritations, applied to the extremities of the Nerves, deranging the action of the Brain.

The connection, relation, and sympathy of one part of the Brain with another, have not yet been fully traced; and our knowledge of the uses of the different parts of that organ is still very defective. We have as yet ascended only a few steps of the ladder, and until we shall have reached the summit, the symptoms of many of

the organic diseases of these parts cannot be determined.

The diseases of the Brain are sometimes combined, or follow each other in succession by insensible degrees. Thus Epilepsy is sometimes combined with Hydrocephalus, Hydrocephalus sometimes terminates in Mania, Apoplexy in Palsy, and Neuralgia in Apoplexy.

It is also to be taken into account, that the earlier symptoms of Hydrocephalus are sometimes those of a derangement of the functions of the alimentary canal; hence it may be mistaken for a disease of that part. For autho are by no means agreed, whether disease of the Brain be consequent or antecedent to a derangement of the functions of the abdominal bowels, and much obscurity hangs over the effect of intestinal action and irritation.

It has not been determined whether or not the effusion of water into the ventricles of the Brain, be the original disease and cause of the symptoms, or is generally the consequence of a low degree of inflammation of the Brain, or of some excitement or specific action of the Brain itself, or of its bloodvessels, not far removed from inflammation.

The very vague manner in which the seats of organic diseases of the Brain have been described, has impeded the progress of our knowledge concerning the symptoms which are connected with diseases of certain parts of that organ. This source of error might be remedied, by dividing artificially the head according to the plan followed in constructing globes. Thus, if a line be drawn in the direction of the superior longitudinal sinus, and another across the head from ear to ear, and if the interspaces be divided into inches or half inches, and the depth of the Brain be measured in a vertical direction, the seat of a disease may be determined with mathematical precision.

Nearly twenty-five years have elapsed since I began to direct my attention, in an especial manner, to the organic disorders of the Brain. I have already published in Dr DUNCAN's Annals of Medicine for 1803, the results of my researches into the structure of the Skull and Brain, in that species of Hydrocephalus in which the head is much enlarged.

I intended to have published the sequel of my observations after a short interval of time.

But the great diversity of symptoms and of morbid appearances which presented themselves during the prosecution of the subject, pointed out to me the danger of drawing conclusions from first, and perhaps wrong impressions, and also the necessity of postponing the communication of my thoughts to the Public, until they had been matured by further observation and reflection. Indeed, at one period I had abandoned the idea of prosecuting the subject farther, owing to the difficulties and contrarieties which presented themselves.

The death, however, of a near relative, who fell a victim to a species of Hydrocephalus, which was to me quite novel, and of peculiar interest, from its striking accordance with the results of experiments performed upon the eighth pair of nerves, gave a new impulse to my investigations; and with my mind fully bent upon prosecuting the subject, and eager to grasp at whatever was presented to my notice, I have now accumulated a number of facts, which may, perhaps, be deemed interesting by the Public, and worthy of being put on record.

If the value of these concentrated facts, (for several of which I am indebted to my much

esteemed friends, Sir JAMES MACGRIGOR, Drs HOME, DUNCAN *junior*, ALISON, ABERCROMBIE, CHRISTISON, MONCRIEFF, TRAILL, KELLIE, CULLEN, Professor BURNS of Glasgow, and Mr WATSON), be not over-rated, the sooner they are delivered to the Public the more likely they are to do good.

From the situation I have held for nearly thirty years in this University, I have paid much attention to the Anatomy of the Brain in its sound and morbid state, as well as to the functions of this important organ; and have had frequent opportunities of examining the state of it in criminals almost immediately after death, by which I have gained a more intimate acquaintance with the colour, consistence, and texture of the Brain in its healthy state, and have been thereby enabled to discriminate more accurately between the healthy and diseased state of that organ.

During the seven years I officiated as Physician to the Royal Public Dispensary, and also during the exercise of my profession in private, I have had many opportunities of examining the various disorders of the Brain in their several varieties and combinations, of which I took full notes, when they were fresh in my memory. The

materials of this volume have been derived to a considerable extent from that source: For I have extracted from my note-book whatever appeared worthy of the attention of the Public; and may, perhaps, in the opinion of some, have drawn too largely upon it; but considering the nature of the subject, which has given rise to so much contrariety of opinion amongst men of the most distinguished talents and extensive information, it seemed necessary to put the reader in full possession of the facts, in order that he might be the more competent to judge whether or not the inferences deduced from these have been legitimate. The importance of such investigations will be properly estimated by Physicians and Surgeons of experience. They form the basis of discovery, and are an unerring guide to just principles of practice.

When the facts, relative to an order of diseases, and the known modes of cure, are fully ascertained, it may be permitted to the philosophical inquirer to begin the process of generalization, and to draw those ultimate conclusions which the knowledge thus acquired may seem to warrant. This is the order of science, and the only method of procedure from which may

be expected any substantial or useful improvement.

Every addition to our knowledge, concerning the origin, the progress, the external symptoms, and other concomitants of disease, is an instrument of still further discovery, and a source of power to the skilful practitioner; at once purifying and extending his vision; directing him in the process of examining his patients; enabling him to detect in its seat the latent cause of the evil, to which he is called to minister; and awakening his ingenuity to disarm, or oppose its malignant influence, by exciting in the system a new series of action, and applying its strength to work out its deliverance. At the same time, it ought to be remembered, that it is not of small avail to learn the reasons of the failure of the different attempts which have been made to remove the cause, or obviate the effects of organic derangement; as this knowledge may suggest new and improved methods of treatment, better adapted to the nature of the malady.

Even in those more painful cases, in which there is no hope of an ultimate cure, such knowledge may still be valuable in directing us to the means of soothing and sustaining the patient in

his lingering conflict, and of giving him all the relief of which his condition is susceptible.

Reflections like these are not ill calculated to rouse the industry and ambition of those who are engaged in medical pursuits, and to determine them to the vigorous cultivation of Morbid Anatomy, from which, as yet, we know not all the benefits that our successors are destined to derive.

These, I may repeat, were the chief inducements to my own exertions; for, to adopt the language of Mr Burke, "I never should have taken the pains to digest my observations, much less should I have ventured to publish them, if I was not convinced that nothing tends more to the corruption of science than to suffer it to stagnate."

I do not profess to give a comprehensive and connected view of the literary history of various disorders connected with organic derangements of the Brain. My leisure has not permitted me to range over so extensive a field of medical literature; for the press has furnished so many materials, that life is too short for the study or even perusal of them.

I have divided my subject into two Parts,

each of which will be illustrated by Engravings by the best artists. The object of the *first*, is to give a graphic and concise sketch of the disease called *Hydrocephalus* or *Hydrencephalus*, a disease which is extremely prevalent and fatal *. As an introduction to the history of this disease, I have given an account of the physical and chemical qualities of the effused fluid, and of its various situations within the head, together with a description of such organic derangements of the membranes or substance of the Brain, as sometimes accompany the preternatural accumulation of the fluid.

My Second Volume will be dedicated to the history of Apoplexy, Epilepsy, and Mania, and to the effects of injuries of the Head.

I am apprehensive, that, after the most careful attention I have employed in collecting and arranging my materials, many defects, resulting from the misapplication of facts presented to my notice, may still be observed by a dis-

* According to Dr COINDET, 20,000 die annually in France from this disorder. According to Dr ALISON, 40 out of 120 patients died of Hydrocephalus at the New Town Dispensary of this city; and from the Annals of the Universal Dispensary of London, published by Dr DAVIS, 8 out of 45 died from Hydrocephalus.

cerning eye. I rely upon a favourable reception at the tribunal of the Public, rather from the obvious utility of the subject than from the manner in which the task has been executed.

If public opinion shall be favourable, and shall lead me to suppose that my exertions have not been in vain; if, by inviting further inquiry, facts shall be discovered tending to an improved diagnosis, prognosis, and mode of treating disorders proper to the nervous system; and if the evidence adduced shall be considered satisfactory, that Hydrocephalus does not invariably prove fatal when a vigorous mode of treatment, adapted to the peculiar cause of the disease, has been pursued at its commencement, one great object in publishing will have been gained.

To conclude:—another consideration, though more strictly personal to myself, will, I trust, be allowed to be a laudable one.—As a Professor of this University, I am anxious to convince the Public, and especially those Friends and Patrons who placed me in that honourable situation, that I have not been inattentive to the obligations which it imposed on me: and that, in this instance, as in many others, I have

been ambitious of treading, though with unequal powers, in the footsteps of my Father and Grandfather, who, for many years, filled the chair I now hold, with credit to themselves, and advantage to their country.

EDINBURGH,
November 26. 1827.

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OF

HYDROCEPHALUS.

CHAPTER I.

GENERAL REMARKS ON THE EFFUSION OF A FLUID WITHIN THE HEAD, ON THE PHYSICAL AND CHEMICAL NATURE OF THAT FLUID, ON ITS DIFFERENT SEATS, AND ON THE CONCOMITANT ORGANIC DERANGEMENTS.

THE various disorders connected with derangement of the organic structure of the Brain, or its investing membrane, constitute a very important subject for investigation, which has been, and I hope will be, more fully elucidated by appeals to morbid anatomy.

As the study of organic derangements, in all their variety of appearances, is a sovereign antidote against premature and ill-founded hypotheses, and leads to that species of inductive reasoning, which the genius of the great BACON so happily introduced into other branches of philosophy, I have treated, in this chapter, of the subjects enumerated in the title, these being the bases of

my reasonings, as to the origin, prognosis, and method of treating Hydrocephalus. By this plan, the reader will be better enabled to judge how far my conclusions are legitimate upon a subject, concerning which numerous and contradictory opinions are entertained by medical writers and medical professors.

The membranes that cover the brain, and that membrane proper to the ventricles, are of a serous nature. Their surfaces are bedewed by a serous fluid, which is derived from the exhaling branches of the arteries, and is returned into the mass of blood by corresponding absorbing vessels. During life and health, there is an exact balance between the quantity of fluid which is exhaled and that which is abstracted; but by disease, this balance is destroyed. On the one hand, too small a quantity is supplied, and a dryness incompatible with the ease and freedom of motion follows; and, on the other, a greater quantity is poured out than the absorbent vessels can take up, which occasions an unnatural or morbid accumulation.

According to some authors, there is not only a moistening of the surfaces of these serous membranes, but also, during life and health, an accumulation of a small quantity of fluid within them, the pressure of which is supposed to be essential to the healthy functions of the brain. But such an opinion appears to be untenable, as it rests neither upon incontrovertible evidence, nor upon analogy. This point can only be determined by examining the brain of a healthy animal after decapitation, whilst it is still warm.

The only dissections of the human brain that bear directly upon this point, with which I am acquainted, are those of Messrs WENZEL, who have reported, that

they found a small quantity of water within the inferior cornua of the lateral ventricles of the brain, in two of three criminals who had been guillotined. But a repetition of similar observations appears to me to be necessary, in order to prove the existence of even a very small quantity of fluid in the ventricles of the brain during health, and the more especially as there is no water found in the brain of sheep.

A small quantity of fluid is generally found within the ventricles of the human brain after the lapse of twelve or sixteen hours after death; but this is no proof of the existence of water in that situation during life, the fluid being generated by the condensation of the halitus, which may be observed to escape when the brain has been exposed, while it is still warm.

Besides, the accumulation of even a small quantity of water between the membranes, or within the ventricles of the brain, could not have failed to be very prejudicial to the functions of the brain, which are deranged even by a slight degree of pressure; and, it may be added, that the detection of a small accumulation of water between the membranes, or within the ventricles, has, on many occasions, been the only means of explaining the symptoms of mania, epilepsy, or chorea, which had preceded death.

To enter into a detail of the varied laws which regulate the functions of exhalation and absorption, or which modify the nature of the exhaled fluid, would lead to a long digression. I shall only observe at present, that a morbid effusion of a fluid between the membranes, or within the ventricles of the brain, is generally to be imputed to a derangement in the circulation of the blood through that organ.

The fluid occasionally lodged between the membranes, or within the ventricles of the brain, is generally as transparent as the finest spring water, and generally has neither smell, colour, nor taste; but sometimes it is of a yellowish or greenish hue.

When water is accumulated at the base of the brain, it is, in some instances, somewhat turbid, like water holding in suspension a very small quantity of clay; when, at the same time, the pia mater is inflamed. Some authors mention films of coagulable lymph floating in the aqueous fluid within the ventricles of the brain, in cases of hydrocephalus, mania, or epilepsy, but I have not had occasion to observe any such.

With the view of attaining a more accurate knowledge of the chemical nature of the effused fluid, many years ago, I requested the favour of my colleague, Dr DUNCAN *junior*, to analyze the fluid found within the ventricles of the brain of a child who had died from hydrocephalus. He sent to me the following report upon it:—"The fluid was pellucid, with a very slight tint of green, and, on agitation, threw up a deal of very permanent froth. On heating it to ebullition, it was very slightly altered; but it formed a very slight precipitate with solution of muriate of mercury. By extract of Goulard, it threw down a very copious precipitate. It therefore appeared to me to consist chiefly of mucus, with a very small proportion of albumen."

Since that time, my late distinguished friend and pupil, Dr MARCET, analyzed the fluid found within the ventricles of the brain in hydrocephalus, and the following is the result of his experiments:

"The solid contents of 1000 grains of the fluid appear to consist of,

Water, - - - - -	990.80
Muco-extractive matter, with a vestige of albumen, - - -	1.12
Muriate of soda, - - - -	6.64
Subcarbonate of soda, with a vestige of an alkaline sulphate, - -	1.24
Phosphates of lime, with traces of phosphates of magnesia and iron,	.20."

The subjoined analysis of the fluid drawn off by tapping the brain during life, has been given by that eminent physician and chemist, Dr TRAILL of Liverpool*:—

"The first, in July 1817, was a very pale fluid, containing very little albumen, and had rather the characters of a mucus than of serum. This arose from the presence of lactates, with a minute proportion of albumen. Its specific gravity was only 1.0058; it did not coagulate when boiled, but by evaporation afforded a thin semitransparent pellicle, which, when thrown into water, became soft and yellowish, like mucus. The hydrocephalic fluid was not precipitated by infusion of galls. It afforded a copious precipitate with nitric acid, and with superacetate of lead. With this last, the precipitate exceeded that which serum, drawn from a patient under ascites, affords to the same reagent. The saline contents of the hydrocephalic fluid were, a considerable quantity of muriate of soda; an alkali not fully saturated with acid, for the fluid rendered vegetable infusions green; phosphate of soda, and some salt of lime,—for oxalic acid gave traces of the presence of the latter.

"Some months after the first tapping, the child's

* Edinburgh Medical and Surgical Journal, vol. xvii. p. 237.

head was again punctured, and eight ounces of fluid were abstracted. This, however, had all the characters of diluted serum. Its specific gravity was now slightly increased, being = 1.0080. When slowly evaporated, it formed a pellicle which was slightly opalescent, but when near the boiling heat, it yielded an opaque yellowish white coagulum, indicating the presence of a considerable quantity of albumen. This, when slowly dried at a temperature a little above 212°, became brittle and corneous in appearance. It was now cut in pieces, and well washed with distilled water, to separate the saline matters, and again dried. The albumen then = 151.6 grains. The washings afforded by spontaneous evaporation many cubic crystals of muriate of soda. The whole was digested in alcohol. There remained in the capsule little friable whitish lumps, which, when dry, adhered together by the intervention of a gummy-looking matter, which seemed to be some compound of lactic acid. The rest of this portion seemed to consist of earthy salts, and equalled 1.9 grain. The soluble salts, when dried at a temperature of 212° = 28 grains, chiefly consisting of muriate of soda, a little muriate of potash, with some small quantity of lactates and subcarbonate of an alkali."

The membranes of the brain are serous membranes, and consequently liable to a preternatural accumulation of the fluid which besmears their surfaces; hence matter is effused in different situations within the head.

When water is lodged within the brain, it is sometimes effused on the cellular substance, beneath the skin of the forehead or occiput.

A few instances have been described of what have been called Watery Tumours of the head.

According to CALLISEN, the water is lodged under the tendinous aponeurosis of the occipito-frontalis muscle; and when the disease has been of some duration, the skull attains a morbid thickness, and water is lodged under it.

A small quantity of water has sometimes insinuated itself between the laminæ of the dura mater. Such a case lately fell under the notice of Dr DUNCAN *junior*. The tumour was small, and did not occasion any inconvenience to the patient.

Three different kinds of encysted tumours containing water, have been found within the human brain.

To the first the name *hydatid* has been given, from the watery nature of the contents of the cyst. The size of these hydatids varies from that of a millet-seed to that of an orange. They are not peculiar to the human body; but are more frequently found within the brain of the inferior animals. In my book on the Morbid Anatomy of the Gullet, &c. I have described several kinds of these. I met with an example in which a hydatid was lodged within the substance of the human brain. The patient, a stout man, twenty years of age, complained of constant headach, chiefly on the right side, followed by a dilatation of the pupil, and epileptic fits, which proved fatal. On dissection, the cranium was found to be much thinner on the right than on the left side, particularly the right parietal bone, which, in many places, *was not thicker than a wafer*. On opening the right ventricle of the brain, a cyst, about the size of a goose's egg, was found within it, filled with a watery liquor, and surrounded by a gelatinous matter, which did not adhere to the membrane lining the ventricle.

Mr SEVILLE lately met with several of these hydatids (which he calls *acephalo-cysts*) under the dura mater; some adhered to the arachnoid coat, and others were immediately under it, and were sunk in a depression of the brain, and there were some in the corpus callosum. He adds, there were several in the veins of the brain. The patient had long laboured under headach, and died suddenly.

CUVIER and RUDOLPHI regard these cysts or hydatids as the general envelope or habitation of a genus of animals called by the latter *Cystocercus*, and containing several species; *C. cellulosus* being the species found in the cysts occurring in the human brain *.

Plate I. appended to this volume, shews that these animals are multiplied by the adhesion of smaller cysts to the inner surface of the inner coat of the larger cyst.

The aggregation of a number of very small hydatids sometimes forms a small tumour, which is imbedded within the choroid plexuses. See Plate I. fig. 2.

One of the most extraordinary circumstances connected with the history of hydatids (which I believe I discovered), is, that those parts which are in the vicinity of the animal are wasted: thus the skull is rendered soft; and thus hydatids pass out from the organs within which they have been originally imbedded, as from the liver or ovarium, into the cavity of the abdomen; and from a similar cause, they are thus occasionally discharged from the body by the anus or skin †.

* Dictionnaire des Sciences Naturelles, Art. Cystocerque et Hydatide.

† For a more particular account of hydatids, see my Morbid Anatomy of the Gullet, Stomach, and Intestines.

Preternatural encysted dropsical tumours are not unfrequent in the choroid plexuses. The thickness of the cyst of such tumours occasions an alteration in their colour; when thin, they assume a yellow colour, and are semitransparent; but when thick, which is not unusual, they assume a grey colour; and, on some occasions, the tumour has a long narrow neck, like a Florence flask.

Some years ago, I was consulted by a father respecting his son, a child of two years of age, whose head at birth measured in circumference $18\frac{3}{4}$ inches, and across the head, from ear to ear, 11 inches. The child sucked well, heard very distinctly, and was awakened from sleep by the slightest noise. I observed that there was an enlargement of the lymphatic glands at the occiput. After the lapse of six months, the head measured at its greatest circumference 25 inches, and 16 inches across from ear to ear. I explained to the father at some length, the incurable nature of the disease by any medicine taken internally; upon which he asked me, whether *the water might not be drawn off by an instrument?* I employed many arguments to convince him of the danger of such an operation; but to no purpose. He returned to my house in the course of a month, and told me that his son had died sixteen hours after the operation of tapping the brain, and requested the favour of me to open the head. I accordingly did so, and I found cysts, with bloodvessels passing along their coats, of different sizes, floating in about two pounds of clear fluid*. I observed that two of these cysts had been perforated. The choroid plexuses were paler than natural. The cerebellum around the fourth ventricle had attained an

* Dr Hooper has given an excellent representation of a case somewhat similar to this in his 14th Plate.

unnatural hardness, and the crura cerebri were ulcerated.

It is a very remarkable circumstance, that serous membranes sometimes secrete a substance like spermaceti or wax. In my Outlines of Anatomy, I have described a case, in which I met with a quantity of a yellow substance, like bees' wax, within the substance of the testicle. There is a case of hydrocele, in the Museum of the University, in which the vaginal coat is very much thickened and indurated, and in which there is a quantity of a substance, like spermaceti, mixed with water. On the upper and back part of the tumour, there was a portion of the tunica vaginalis covered by small tumours, like flattened peas, and these were covered by a dense shining membrane. On referring to authors, I met with a case, which has been described by Mr PAISLEY *, in which there was a tumour on the dura mater, under the parietal bone of the left side; in which he observes, " I discovered a great number of little white bodies, like small worms in blown meat. These, I apprehend, were small portions of spermaceti." It may be added that Mr PAISLEY found a considerable quantity of water within the ventricles of the brain.

A cyst, containing a yellow coloured serum, is not uncommonly found within the substance of the brain of those who have fallen victims to apoplexy; and it has been said, that their number corresponds with the number of the apoplectic attacks.

Cysts of this description originally contain blood, the red globules of which are removed by absorption.

The changes which take place in such cysts, after blood has been effused, were very obvious in a case

* Edinburgh Medical Essays, vol. iii. p. 308.

which I attended in the year 1809, along with the late Dr KILGOUR of Musselburgh, and the late Mr FYFE, my assistant. A drawing of the morbid parts was made at the time by Mr P. SYME, from which the annexed Plate II. was taken, and has often been exhibited to my pupils, together with the original.

The part of the cyst which is next to the dura mater, was in part filled by coagula of blood of a purple colour; but the rest of the sac, and canal leading from it downwards for about an inch, were filled by an orange-coloured serum. The parietes of the sac, which are lined by a thin membrane, had a shrivelled appearance; and hence it is probable, that, if the patient had lived for a few months longer, the sac might have been obliterated, in consequence of the adhesion of its opposite sides. The brain around this canal was unusually soft.

The effusion of a small quantity of water between the pia mater and arachnoid coat of the brain, is a very frequent morbid appearance, and is sometimes co-existent with water within the ventricles, or at the base of the brain, and water is sometimes contained only within the ventricles.

The watery fluid in the disease called Hydrocephalus, generally occupies the four large ventricles of the brain, as these freely communicate with each other, and the quantity of the fluid depends generally upon the duration of the disease, and varies from an ounce or two to several pounds. When a small quantity of fluid is lodged within the ventricles, these undergo no perceptible change as to size or form, but when several ounces of fluid fill them, they become considerably and externally enlarged, and partially distorted in form (Vide Plate III.), and the

still further accumulation of a fluid gives occasion to the disjunction of the bones of the skull.

As the third ventricle is inclosed within the thalami nervorum opticorum, it is not so much enlarged as the lateral ventricles. The enlargement of the communication between the lateral ventricles keeps pace with that of the other constituent parts, and it has sometimes attained so large a size as to give passage to the little finger.

My Father, at an early period of his life, directed his attention to the state of the brain, when water had been accumulated within that organ. I have availed myself of a part of his observations in the subsequent quotation.

" In 1753, I opened the head of a child about two years old, who died of internal hydrocephalus. Both sides of the brain were *distended with the water*; but on cutting into one hemisphere, the other subsided.

" Soon after this, I opened the head of a girl of eight or nine years of age, who likewise had died of hydrocephalus, with the same event, and drew off from the ventricles of the brain near four pounds of water, as all who were present reckoned, for we did not measure the quantity. The whole substance of *the brain was unusually hard and tough*, and the collection of water I conjectured to be owing to a scirrhosity, which I remarked in the tuber annulare and one of the crura cerebelli.

" After laying open both lateral ventricles longitudinally, I took hold of the corpus callosum, and raising it gently, and with it the septum lucidum and fornix, I observed and demonstrated to Mr J. MONRO, Mr HALLEY, and several students of physic, *a passage large enough in this subject to admit the finger, under the*

fore part of the body of the fornix, by which the lateral ventricles communicated with each other, and with the top of the third ventricle.

" That winter, I demonstrated this passage in the body of a malefactor, and have always since found it at the very same place of the brain, whether I examined the sound or the dropsical brain, with the difference only, that, in the latter, *it was always enlarged.* In all my dissections of the bodies of children who had died of hydrocephalus (and I have now dissected seven), all the water was lodged within the ventricles. From which, and from my observing that the most accurate authors have generally found it so likewise, I am inclined to suspect, that some have thought the water to be on *the outer side of the brain, when in fact it was within it*, partly from supposing it impossible that *the very tender substance of the brain could be so enormously extended;* and partly from their not knowing that the brain, *when extended, becomes very thin* *, perhaps more than most other organs, when distended by a like cause. Thus in the brain of the girl of eight or nine years of age, above mentioned, the ventricle was opened before the knife entered above the depth of half an inch; so that unless the skull-cap be very cautiously cut through, the water, by a slight cut or puncture, may be let out, and the dissector hence conclude that it was lodged on the outer side of the brain.

" The lower ventricles of the brain have been supposed to communicate in a sound body with the cavity of the medulla spinalis; and some authors, particularly

* It is obvious from the above, that in cases of hydrocephalus the *brain is extended*, an opinion which Drs GALL and SPURZHEIM have also adopted.

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ish colour, and on being divided, many red points were observed in the latter. The substance of the brain was *very tough*. The third and also the lateral ventricles were broader than usual, especially the posterior cornua: the thalami nervorum opticorum were of an unusual breadth, and those of the opposite sides were dissimilar in form. The passage of communication between the lateral ventricles was of considerable size. The laminæ of the septum lucidum were separated from each other, and water was lodged between them. The tela choroidea was very vascular. The third ventricle was much enlarged. The fourth ventricle was of the usual shape and size. The first pair of nerves was considerably shrunk. There was a tumour about the size of a filbert nut, connected with each of the optic nerves.

On some few occasions, water occupies only one of the lateral ventricles, owing to an obstruction of the passage of communication between them, a circumstance which in a particular manner attracted the notice of that excellent pathologist, the late Professor RUTHERFORD, who thus described it: "When water is preternaturally gathered in the lateral ventricles, it is sometimes observed to be contained in much greater quantity in one of them than in the other; and I have seen one of the ventricles much enlarged, and full of water, while the other remained of its natural capacity, and contained hardly any water. This appearance, however, I should not impute to the obliteration or obstruction of the communication betwixt them, but to one side of the brain having been more affected with disease, more *flaccid and tender*, than the other, in consequence of which a greater exudation had taken place." The vessels of this part and the

sides of the ventricle, had yielded more readily to the pressure of the water, as it was effused. MORGAGNI, in his Epist xii, has made mention of the greater distention of one of the lateral ventricles. He observes, "Prussius tum illa, tum aliis duabus observationibus, quo latere aut omnino, aut præcipue caput doluit, ejus lateris ventriculum aut solum aut longe magis aqua fuisse distentum." From the above quotation it follows, that, in the opinion of the author, this distention of the ventricles is the cause of the pain, and that the seat of pain on one side of the head, marks the seat of the accumulated fluid.

When the quantity of fluid accumulated within the head exceeds a pound or more, the head is monstrous, from the great disproportion between its cranial and facial parts, the former being much expanded, whilst the latter is not so; and also from one side of the head being generally larger than the other. This form of hydrocephalus sometimes takes place before birth, and proves a cause of difficult labour; and, in some instances, the head has been so large, that it was necessary to open it before delivery could be accomplished. The forehead occasionally is so prominent as to prevent the patient from seeing objects above the level of the eyes. The head extends rapidly, and, in the course of six months, has sometimes attained so large a size as to measure, at its greatest circumference, upwards of 22 inches, and from the root of the nose to the nape of the neck 16 inches. I have met with one instance of a child that died when sixteen weeks old, whose head measured, at its greatest circumference, 24 inches. When the disease has been protracted for many years, the head becomes of an enormous size: the

head of one of my patients, who lingered under this disorder for twenty-six years, at its greatest circumference, measured 43 inches.

The distortion of the orbits has not been attended to by authors, though a constant concomitant of a very large head. The orbitar plates of the frontal bone being pushed downwards, and thus rendered convex, the eyeballs are forced downwards and outwards, and, at the same time, the superciliary ridge is raised about half an inch beyond its usual level.

The bones of the skull of a child born with a large head, are commonly flexible, and so thin as to be semitransparent; so that when the head is examined by candlelight, it looks like a horn-box, and the ramifications of the temporal artery and the superior longitudinal sinus may be seen. I had occasion to meet with an instance in which there seemed to be nearly a total want of ossific matter, as the skull, if it might be so called, was turned down like the flaps of the skin. And there is frequently a deficiency of bone at certain parts of the head; hence we sometimes meet with tumours, of different sizes, of a round or oblong form, situated at the occiput, or towards the crown of the head, filled by a watery fluid, and, upon examination, these are found to communicate by means of an opening in the skull with the internal parts. Such tumours are nearly transparent and colourless, and do not occasion any degree of pain. In the large hydrocephalic skull of the infant, the bony fibres which shoot from the centre towards the circumference of the bones, are disjoined, and between these, there are membranes upon which the larger arteries, filled by red blood, proper to the bone, are distributed; and in the

interstices between the portions of bone, there is an effusion of bloody serum. The anterior and posterior fontinelles are unusually large.

I have never observed any appearance of diplöe, even where the disease has been of some years' duration.

Of the Changes in Size and Shape which the Head undergoes during the different stages of Hydrocephalus Chronicus, and of the State of the Brain.

The several and successives changes in size and shape which the head undergoes during the different stages of *hydrocephalus chronicus*, afford a striking illustration of the influence of the brain upon the form of the skull, and also of the effect of posture and pressure.

In consequence of this disease, the head soon acquires a preternatural size * and form.

Before proceeding to endeavour to explain the form of the skull in the different stages of hydrocephalus chronicus, it may not be improper to observe, that, when the forehead is naturally very prominent, as we observe in some families, it becomes very remarkably so from hydrocephalus chronicus †.

The uniform and equal growth of every part of the bones of the brain-case may be distorted by posture.

I have described ‡ two cases, which afford striking examples of the operation of posture and pressure in modifying the form of the head. In the former, from the

* I have seen the skull of a person who died from hydrocephalus, which measured 50 inches in circumference.

† Vide Case which I published in Dr DUNCAN'S Annals of Medicine for 1803.

‡ Vide Dr DUNCAN'S Annals of Medicine for 1803.

boy sleeping most frequently on his back, the back-part of the head on which he rested became flat: and as, in the latter case, the child was suckled at one breast only, the pressure of the mother's arm prevented the one side of the head from bulging out so much as the other.

In the hydrocephalus chronicus, the brain resembles a bag filled with water.

I have endeavoured to shew that the brain serves as a mould upon which the skull is formed; and the following observations seem to me to afford still farther evidence in support of that opinion.

It seems probable, that, in the hydrocephalus chronicus, there is not the usual balance betwixt the actions of the arterial and absorbent systems. The arteries of the brain do not secrete the usual quantity of medullary matter; while the absorbent vessels, in consequence of distention and pressure, act much more powerfully than usual, and remove a portion of the brain.

In such a morbid state, the water contained within the ventricles will push the brain outwards, and separate the bones of the cranium to a greater or less distance, in proportion to the quantity of water effused. In a case which I attended, a child only nine months old, required a hat fit for a child four years old.

The preceding observations appeared to me necessary to the more perfect understanding of the changes which the head undergoes, in shape and size, in the successive stages of hydrocephalus chronicus.

Keeping these in view, and marking the progress of ossification, with the mode of attachment of the different bones of the skull, the phenomena that present themselves appear to admit of a satisfactory explanation.

It is obvious, where the internal pressure is great-

ly increased, and the bones of the skull give way, that this enlargement must be unequal, owing to the unequal resistance.

As the chief circumstances upon which this unequal resistance depends, in my opinion, are the progress of ossification, and the connection of the different bones of the head, I shall now proceed to explain the effect of these more fully.

From the imperfect ossification of the bones of the head, when the child is born, it follows, that, if the disease originated while the fœtus was *in utero*, the skull must more readily give way, and more readily acquire a large size, than when the disease occurred at a later period of life, and where the bones of the skull were burst asunder, after having been previously united.

In proof of which, the head of one of my patients, a female of two years of age, though it had attained a large size before birth, increased six inches in circumference in the course of nine months. Hence it would appear, that, during the progress of hydrocephalus chronicus, the water is not gradually and uniformly effused; and, in some instances, there seems to have been a stop put to the disease, for, though the skull was completely ossified, she did not suffer from the slightest degree of headach, and possessed all her intellectual faculties.

As the skull after puberty rarely gives way, the brain must be much compressed; which compression speedily leads to stupor, convulsions, and death, or to hydrocephalus acutus.

The form of the skull of the fœtus is very different from that of the adult: in the former, *the skull projects remarkably at the original centres of ossification of*

its component pieces *, and hence the upper part of the skull of the fœtus is not so round as that of the adult.

In the adult, those prominences which are very apparent in the fœtus, disappear, owing to the gradual growth and alteration of the shape of the brain, which, as already remarked, serves as a mould on which the skull is formed; the skull adapting itself to the form of the brain.

But as, in consequence of hydrocephalus, the growth of the brain is checked, or in some measure suspended, the brain does not acquire its usual form; and as the brain is pushed outwards from the accumulation of water within it, the bones of the cranium, though they increase in size, *retain the form they had when the child was born;* and the ossific spiculæ, instead of describing portions of spheres, as they do at a later period of life, describe only straight lines from their centres of ossification *; and the centres of ossification of the component bones of the skull being at the greatest distance from the centre of the brain, though they do not yield, are protruded outwards by the contiguous parts of the bones.

Hence the head of a child labouring under hydrocephalus chronicus, notwithstanding its increased bulk, preserves, for some time at least, the form it had at birth *.

Some of the prominences on the head are more apparent than others: those on the forehead especially are apparent even to the most superficial observer: the others also may be discovered by a careful examination.

These prominences, in cases of hydrocephalus, corre-

* Vide Plate 21st in my Outlines of Anatomy.

spond in situation, as in the fœtus, with the original centres of ossification of the different pieces of the cranium *.

The os frontis in the fœtus is composed of two pieces. Two projecting parts are seen in the foreheads of all children labouring under hydrocephalus chronicus. There is also *a well-marked projection on each side of the head*, corresponding with the centres of ossification of the parietal bones.

There is only one projection in the upper and middle part of the os occipitis, which corresponds in situation with the largest piece of the os occipitis of the fœtus.

It also frequently happens, that there is a *marked inequality in the size of the projections on the opposite sides of the head*, which gives the head a distorted appearance; and in some instances, such inequality in the growth of the cranium takes place at the back-part of the head; in others, in the forehead.

In one of the cases which I met with, that part of the head which is opposite to the centre of ossification of the right parietal bone, is more prominent than the same part of the skull on the left side; but the skull on the right side, underneath the prominent portion, is almost flat; whereas the corresponding portion on the left side bulges out, and forms a semicircular line downwards towards the neck.

In another case, *one side of the os frontis is much more prominent than the other*, and to such a degree, that, if the profiles of both sides of the head were taken, no one would imagine them to represent different views of the same head: the one resembles the profile of a child

* Vide Plate 21st in my Outlines of Anatomy.

whose *head is a little larger than usual;* whereas the other, from the forehead being very prominent, bears all the characters of the head of a child labouring under hydrocephalus chronicus.

May not the above fact be attributed to a larger quantity of water being effused on one side of the head than on the other?

Such, in general, is the state of the head in the first stage of hydrocephalus chronicus; but it is proper to remark, that cases occur where some parts of the head are below the level of the others, which is probably owing to the ossification not being completed at those places.

During the progress of the disease, the head exhibits many striking varieties as to form and size. It never preserves its natural form. It acquires an unusual breadth; but especially at those parts *which correspond with the centres* of ossification of the parietal bones, and also *in the forehead.*

The effusion of a watery liquor into the cavities of the brain, which takes place to a greater or less degree in different instances, produces these effects *.

The former change is owing to the separation of the parietal bones; the latter is the consequence of the separation of the upper part of the pieces composing the os frontis (for the lower parts of the pieces of that bone, on account of their connections with other bones

* The undulation of a fluid within the head, may be distinctly perceived at the sutures, if the watery liquor has been effused between the membranes of the brain; nay, even where it is effused within the ventricles, especially if the quantity of it be large; as, in such cases, a communication is generally formed betwixt the water which is effused between the membranes, and that within the ventricles of the brain.

which are ossified at an early period of life, cannot recede from each other to any distance); and hence the face, instead of being nearly oviform, somewhat resembles a triangle, of which the brow makes the basis, and the chin the apex.

As the disease advances, *the forehead becomes unusually prominent*, to such a degree, as often to prevent the unfortunate sufferer from seeing objects above the level of his eyes. From the duration of hydrocephalus, the distance from the root of the nose to the top of the head is augmented, and is proportionally much greater than in a healthy child.

During the continuance of the hydrocephalus chronicus, the distance from ear to ear, or the transverse diameter of the head, is increased, and the width of the head is most remarkable between the centres of ossification of the parietal bones. A disunion takes place between the upper portions of the pieces of bone which compose the os frontis, which is the cause of the very remarkable breadth of the upper part of the forehead; and hence the forehead is somewhat of a conical form, the apex of the cone being at the root of the nose, and the base of it at the upper part of the forehead.

From the continuance of the disease, owing to the water contained within the head elevating the *bregma*, and membrane between the parietal bones, the form of the head is still farther changed; *its upper part becoming somewhat of a conical figure*, in consequence of the still greater accumulation of water within the ventricles of the brain.

The internal distention continues to exert its influence over the growing osseous fibres of the skull, which, on account of their length and weakness, do not oppose as

much resistance to the internal distention as the centres of ossification; hence the next change is, the *bulging out of the bones at the sides of the prominences*, which is the consequence of a very large collection of water within the head, and only occurs when the disease has been of two or three years standing; for, in these circumstances, the head cannot increase to a greater degree in the transverse or longitudinal direction.

The bones bulge out at the sides of the original centres of ossification, the most resisting points of the skull; and hence, in this stage of the disease, the prominences in the skull corresponding with the original centres of ossification of the pieces of the cranium, are less apparent than in the head of a child who has laboured under hydrocephalus for a few months only: hence the skull assumes a globular shape, which globe is indented more or less by the child continually sleeping on one side of its head, or on the back of its head.

It is hardly necessary to observe, that these changes in the form of the head take place more rapidly in some cases than in others.

The disease at its commencement, and for some time after, is proper only to the bones of the cranium; but, in process of time, the bones of the face are also enlarged, and become distorted, especially those of the orbits: and the distances between their outer angles are much greater; in one of the cases, it was greater by $1\frac{1}{4}$ inches, than in most men of twenty years of age.

Of the Progress of Ossification in the Sutures.

Should the unfortunate patient linger for some years under hydrocephalus, nature endeavours to give protection to the brain, by completing the ossification of the

skull; the progress of which, and all the symptoms which it gives rise to, I shall endeavour to describe.

This process, probably from the diseased state of the vessels, takes place imperfectly and unequally; so that, in some instances, instead of the whole void being filled up by bony matter, for many months only a few pieces of bone, of unequal sizes and irregular figures, are formed in some of the sutures; and in other instances, the ossification is not completed for years.

This gives rise to the sensation which the mother of one of my patients, a boy of nine years of age, so strongly expressed. She said, that her son's head, about eighteen months before, seemed to her as if it had been broken in several places; but now the whole was consolidated: for the detached pieces of bone in the membranes uniting the bones of the cranium, had, in the progress of ossification, adhered firmly to each other.

The ossification takes place at different times in the different sutures.

The membrane uniting the pieces of the os frontis is generally ossified when the child is between its twelfth and twentieth month.

The membrane betwixt the os occipitis and parietal bones, is not ossified until a much later period of life; and the sagittal and coronal sutures were not ossified in the boy of nine years of age.

These membranes are of unequal breadth; that between the two pieces of the os frontis, and that between the parietal bones, being broader than the others, allow these bones to recede from each other to a considerable distance, and hence, as has been already observed, the head acquires an extraordinary breadth. From a similar cause, the os occipitis is also protruded; and were it

not owing to the patient generally resting on the back part of his head, that part of the head would also become very prominent.

In short, the head acquires its unusual bulk, in part from the greater size of the pieces of the cranium-case, and also from the ossification of the membranes which unite these different pieces together.

There are some exceptions to the above general description; for there is, in some cases, an abundant supply of osseous substance, so that the skull attains even a greater thickness than a healthy skull, and the bony matter is very hard and solid.

Dr AITKEN was so polite as to shew me the skull of a person who had laboured for twenty-two years under this disease. The skull was remarkable in no other respect, excepting as to the great size of that part of it which contained the brain: it was nearly symmetrical, and was as thick as the skull in general is, and consisted evidently of two plates, with an intermediate cancellated structure.

When the accumulation of fluid within the head amounts to several pounds, the brain resembles a bladder filled with water, the greater number of the convolutions being effaced. Upon examining the parietes of this bag with attention, they are found to be various in point of thickness, in different instances, and also in the same case in different places; and in some there is no vestige of the brain to be discovered on that side on which the patient used to lie in bed; and the internal surface of the enlarged ventricles is white.

The distinction between the grey and white matter of the brain is not always to be observed, and, when ob-

vious, these are disposed in a horizontal direction in respect to each other, the brain being unfolded by the accumulated water, a circumstance described by BERTIN * and VATER †.

I weighed the brain in four cases in which the head was enlarged. That of a child that died soon after birth weighed ℥viii.: that of a child, four months old, weighed ℥xi. and a half, and the cerebellum weighed ℥i.: that of a child, thirteen months old, weighed ℥xiv.: and the brain of a child of three months old weighed, without the cerebellum, ℥x.

The septum lucidum is often of unusual length, so that the corpus callosum is much elevated.

In several instances which I have examined, there was no appearance of the corpus callosum, and no septum lucidum.

When the fornix remains, it is split by the accumulation of water in the third ventricle; and the communication between the lateral ventricles is so much extended as to equal an inch in diameter.

The late Mr ALLAN BURNS of Glasgow communicated to me the subsequent history of a patient, who died from hydrocephalus chronicus, which was very remarkable in several points of view. He observes, "*The little of the brain that remained, resembled a thin film lining the inner surface of the pia mater, and even this was in some places wanting.* There was no trace of the corpus callosum, septum lucidum, fornix, corpora striata, thalami nervorum opticorum, or pineal gland. The optic nerves were small, and surrounded by œdematous

* Vide Osteology, tom. ii. p. 500. Paris, 1754.

† Miscellanea Curiosa sive Ephemeridum Medico-Physicarum Germanicarum Academiæ Cæsareo-Leopoldinæ Naturæ Curiosorum. Decuriæ iii. An 9. p. 294.

cellular membrane. *The cerebellum was almost gone*, its lobes were not larger than walnuts, and besides, its structure was much altered, for, to appearance, it was *made up of transparent jelly*, which, as well as what remained of the brain and the whole pia mater, was very vascular. The course of the longitudinal sinus was unusual: it at first ascends straight along the frontal continuations of the sagittal suture; *then it inclines obliquely to the right, through the whole course of the bregma*, till it reaches the sagittal margin of the parietal bone; next, it creeps along this till it comes to that spot where the posterior angle of this bone begins to be levelled off; here it somewhat abruptly twists to the left, and descends obliquely behind the posterior fontinelle, to the centre of the occipital bone."

When much water is lodged within the head, the thalami nervorum opticorum are disjoined, and the corpora striata, which approach each other at their anterior extremities, are separated and flattened, and distinguishable only by their colour.

The passage downwards into the infundibulum is so much enlarged, as to admit the little finger, and also the passage from the third into the fourth ventricle.

The cerebellum has been sometimes flattened by the great accumulation of water within the head, when hydrocephalus has been of several years' duration, which must tend to interrupt the circulation of blood through its vessels.

The pons Varolii and cerebellum are sometimes not affected.

I have seen the pineal gland converted into a bag, which is filled with water.

The olfactory and optic nerves are generally smaller

and harder than in the healthy, and especially the latter, as most patients afflicted by this disorder have been deprived of sight for some years previous to death; but the third pair of nerves is not affected, as the power of moving the eyes has been retained.

The seventh pair of nerves is not affected, as the sense of hearing is seldom or never impaired during hydrocephalus chronicus.

The pituitary gland is sometimes enlarged, and at the same time indurated, when death has been occasioned by the acute hydrocephalus; and, it may be added, that Mr PETIT has imputed the effusion of the water to the morbid state of this gland; but it has been found flattened when several pounds of water have been accumulated within the head.

Dr SPURZHEIM has made mention of a remarkable case, in which "the greater part of the water was accumulated between the brain and the dura mater, but the lateral cavities were at the same time distended by about a pint of fluid, which communicated freely with the liquid collected without the brain, as the corpus callosum, with its extreme folds, was split through its entire length along the median line *."

Dr DUNCAN junior has made an important addition to the history of hydrocephalus in his valuable paper †, in which he has described an instance in which he found the brain bifid, and 136 ounces, by weight, of clear water within it.

In hydrocephalus, the lymphatic glands at the back of the head and upper part of the neck are very frequently enlarged and somewhat indurated.

* Vide SPURZHEIM on the Anatomy of the Brain, edited by WILLIS, p. 186.

† Vide Transactions of Edinburgh Medico-Chirurgical Society, vol. i.

Of the Consistence of the Brain, when water has been accumulated within the ventricles of that organ, or within cysts imbedded in the substance of the Brain.

In order to judge how far the consistence of the brain has been altered by disease, regard should be paid to the age, mode of life, constitution of the individual, and time that has elapsed after death.

During infancy the brain is redder and much softer than during the meridian of life; and it gradually becomes harder upon the approach of old age.

By low living and by chronic disorders, accompanied with great debility, as phthisis pulmonalis, or marasmus, the brain frequently becomes very soft.

The white substance in the deeper parts of the brain, as that around the ventricles and corpus striatum, is, in the healthy state, softer than that towards the surface.

The most favourable opportunity which can be presented, for gaining an exact knowledge of the state of the brain of a healthy person, is that which is supplied by the examination of the brain of a criminal, who had forfeited his life to the violated laws of his country, when in the prime of life and health; and even then, the effect of his previous mode of life, and constitution, should be kept in view.

In the course of my professional pursuits, I have had several such favourable opportunities of investigation, and have subjoined the result of these, which, I trust, may be acceptable to the reader.

The brain, when in a very recent state, is of a purplish-
wn colour, and somewhat elastic; it is firm to the

touch, and may be divided into thin slices, without any part of it adhering to the knife, and may be stretched to a certain degree without tearing. But when the brain has been exposed to the air for an hour, or an hour and a half, or when examined after the lapse of twenty-four or thirty hours after death, even although death has not been occasioned by disorders which affect the nervous system, the brain is soft, readily torn, and a portion of it adheres to the knife, unless the knife has been previously dipped in oil or water; and it falls to pieces on being slightly stretched. A slice of the recent brain put into water, does not render the water turbid for ten or twelve hours.

The consistence of the brain of the criminal is not uniform.

In the case of a pirate, which a few years ago attracted much notice, and who was a young, stout and active man, the brain was softer than usual, though it was examined only two hours after death.

This softness of the brain was not peculiar to this man's brain, for I have remarked the same in other criminals some years ago. I communicated to Dr KELLIE my observations on this point, which he inserted in his very important paper on the effects of cold and congestions of the brain, from which the subjoined is an extract: "On removing the membranes, the brain was found to be rather of a paler colour than usual, *and felt remarkably soft*, so that it gave way at the corpus callosum, upon which some reddish coloured fluid was discharged from the lateral ventricles, but owing to the rupture I could not ascertain its quantity. *The brain was much softer internally than externally, so that I could not demonstrate any of the deeper parts to my*

pupils,—a circumstance which never before occurred to me during the nineteen years I have been a Professor. Since I wrote to you, I have found a few observations I had made on the brain, and amongst them particular mention is made *of the softness* of the brains of criminals *."

From what has been above stated, it may be inferred, that the brain of the most healthy sometimes becomes softer than usual,—a circumstance worthy of notice, when the brain of a hydrocephalic patient is examined.

The result of my investigations as to the consistence of the brain of those who have died from hydrocephalus, is, that generally it is neither harder nor softer than the healthy state. When water has been accumulated within the brain, I have observed that the brain could be stretched, on some occasions, without giving way. In the preparation from which Plate III. was taken, the laminæ of the septum lucidum were disjoined to a considerable distance from each other, whereby the fifth ventricle was considerably enlarged †. And it merits notice, that those who have imputed hydrocephalus to chronic inflammation, have affirmed, that the septum lucidum is much attenuated, softened, and generally ruptured; whereas, according to Mr WATSON ‡, the septum, in a case of hydrocephalus, "was much thickened, and perfectly opake."

On the other hand, in a few cases of hydrocephalus, I have found the brain softer than in the healthy state,

* Vide Dr KELLIE's Paper, read 20th March 1822. Transactions of the Edinburgh Medico-Chirurgical Society, vol. i.

† Sir E. HOME and Dr HOOPER have also made mention of the effusion of water between the laminæ of the septum lucidum.

‡ London Med. Obs. and Inq. vol. iv. p. 82.

and especially the septum lucidum, which therefore gives way in the middle, and the aperture in it generally assumes somewhat of an oval form, and with its long axis in the direction of the corpus callosum; but I have never seen the convolutions broken down, as in the preparation from which Plate IV. was taken.

The softening of the brain has been imputed to chronic inflammation, but it is perhaps rather the consequence of debility.

The effect of low diet and debilitating diseases in inducing a softening of the brain, is familiar to those who have devoted much attention to anatomy; and the remarkable softness of the brain of criminals, which I have frequently noticed, may perhaps be imputed to these unfortunate persons being kept on very low diet for some time prior to their execution.

It may be added, that the scrofulous, who are the frequent victims of hydrocephalus, are of a lax habit of body, and this laxity may exist in the brain as well as in the muscular and other systems. "It (as Dr CHEYNE has justly remarked) chiefly falls upon the children of families having a strumous taint."—P. 30.

The brain is also soft after fevers, particularly those of the eruptive kind, and infantine diseases which occasion great debility.

The enlargement of the ventricles of the brain is a striking feature in many instances of hydrocephalus, and it has been explained in two different ways. Some authors have affirmed that it is owing to an extension of the ventricles, and others to the abstraction of a part of the substance of the brain.

After much reflection on this much disputed question,

it appears to me that neither opinion affords a satisfactory explanation of the phenomena.

When the enlargement of the ventricles is not accompanied by the disjunction of the bones of the skull, unless it be supposed that the substance of the brain is compressed into less bulk, a part of it must be removed; and if it be not removed, instead of being softer (as sometimes happens), the brain in that case should be invariably found to be reduced to a much firmer state, as may be done artificially, under the exhausted receiver of an air-pump.

This abstraction of a part of the brain takes place, not only in hydrocephalus, but also when abscesses, cysts or tumours of different descriptions, are formed within the substance of the brain. In order to make room for such abscesses or cysts, a part of the solid substance of the brain must be absorbed.

As an argument in favour of the abstraction of a part of the brain, it may be added, that, in the Museum, there is the head of a calf which contained 15 pounds of water, while the brain weighed ℥ xj only *.

On the other hand, when the component bones of the skull give way, the ventricles of the brain may be much enlarged by extension; and if there be no vestige of brain on the side of the head on which the child has lain, and which I state on the high authority of Sir E. HOME, that circumstance could only have taken place by absorption.

The effusion of water is sometimes combined with the formation of pus, as in the following case, for which I am indebted to Dr LOANE.

* Vide case described in page 31, in which a considerable portion of the brain had been absorbed.

"A—— C——, aged fifteen years, was attacked with pain of her head, attended by some febrile symptoms, on Monday the 21st February 1825. Her complaint appeared so trifling to her parents, that they did not apply for medical assistance before the Thursday following, when I was requested to see her. She then laboured under severe pain in her head, heat of skin, pulse strong and full, though not frequent, constant restlessness, and bowels costive: she also complained of pain in her loins, and had never menstruated. I bled her from the arm to syncope, and had her legs put into warm water: she took also calomel. pp. ss. v., extracti colocynth. ss. iii. The girl seemed much relieved, and continued quiet during the day; but towards evening the pain of her head again returned; the pill operated three times, and the stools greenish and fetid; twelve leeches were applied to the head, a blister was applied to the nape of the neck, and the pill was repeated; slept well during the night, and her bowels affected three times; stools of the same description as yesterday. At six o'clock on Friday morning she complained of severe shooting pains through her head. Her pulse did not indicate any inflammatory action; but as she was before relieved by the leeches, twenty-two were now applied, and a large blister was laid over her head. The calomel was repeated in an increased dose of ten grains, together with five grains of colocynth. The vessels of the conjunctiva of each eye were distended with blood; after the bleeding, that appearance subsided, and she again obtained relief from the pain of her head. I may here observe, that, from my knowledge *of scrofula being in the family to a great extent*, I suspected from the commencement that she was labouring under hydrocephalus acutus. The pill

operated but once. The remaining part of Friday she passed more quietly, and slept a good deal. Towards evening she was again attacked with pain shooting through her head, and several leeches were again applied. Repet. pil. nocte.—Saturday, was restless and uneasy, and complained of not being able to see objects distinctly. Sunday, Dr DEASE recommended perseverance in the application of the leeches, and the calves of her legs were blistered; the medicine was repeated, and warm fomentations were applied. She passed that night quietly, and appeared relieved and sensible on Monday morning; but she complained of blindness, and feeling of weight at the back of her head; her pulse was weak and irregular, and she continued without any pain. About an hour before her death she fell into a stupor, and then only I perceived the pupils of the eyes much dilated. She expired at four o'clock on Monday, P. M., without any appearance of pain, being the fifth day from my first seeing her.

"On examining the brain, the vessels of the dura mater and pia mater were found much distended with blood, as also the longitudinal sinus. The lateral ventricles were filled with water, and the plexus choroides was filled with blood. The other parts of the brain appeared healthy, and of *an unusually firm texture.* Upon raising the posterior lobes of the cerebrum, *a large quantity of green fetid pus was found oozing up from under the tentorium cerebelli. Upon dividing the tentorium, and laying bare the cerebellum, a quantity of the same thick fetid matter was found lying on its surface.* All which appearances accounted satisfactorily for the death of the patient."

the perfect accuracy of the post-mortem examina-

tion I can bear witness, having been present at the dissection.

The pressure was applied, in this case, perpendicularly to one of the hemispheres of the cerebellum, which was thereby diminished in bulk, and to the medulla oblongata, but it did not give rise to any of those symptoms which have been supposed to originate from pressure so applied.

I now subjoin the history of a case which I saw along with my father, June 11, 1803, and which merits particular notice.

The patient, Mr M——, was 70 years of age; "a very stout square-built man; lethargic all his life. He was seized last Christmas with oppression at his breast, which has increased, and which, he says, resembles a knock in the breast when he goes up stairs; urine scanty, and has a greenish tinge; can lie down flat on his back without being oppressed; occasional nausea and vomiting.

"About three weeks ago, he became so lethargic that he slept constantly, except when roused; answers all questions; knows all his family; says he has neither pain in his head, nor in any other part of his body; pulse about 80, and occasionally intermitting; skin for some time has had a yellow tinge." Died comatose.

The following were the morbid appearances discovered on dissecting the body.

On sawing through the skull, it was impossible to take off the skull-cap, on account of the very intimate adhesion between the dura mater and the inner table of the skull, until the one was separated from the other by the knife. The dura mater was also thicker than usual.

On the upper and posterior parts of both hemispheres, there was a fluid of a straw colour, under the arachnoid coat; in which fluid, there were a number of bodies of

a deeper yellow colour, probably masses of coagulating lymph, about two or three lines in breadth, and an inch in length.

In different parts of the surface of the arachnoid coat, there were a number of small bodies of different sizes, and of a pale yellow colour, which were not rounded, but which, upon minute examination, were found to have a number of projecting points. A number of similar substances were observed on the surface of the brain, which, in some parts of it, were collected into groups, but in others were solitary; and these latter were much larger than those that were grouped together. When these substances were pressed between the fingers, they felt as if composed of a tough matter, somewhat like ligament, but were by no means so hard as bone. There was an effusion of a similar fluid on the surface of the tuber annulare. The pia mater and brain had a very pale colour, and resembled very much a brain which had been steeped in water for a few days.

The brain to the touch was evidently harder than in the sound state, and also more tenacious. The medullary substance of the brain had not its usual brilliant white colour, but was slightly brown, and very few red points were observed in it. Upon opening the lateral ventricles, the medullary part was not of its usual brilliant white colour, but of a dirty brownish colour; and the cineritious substance of the corpus striatum was of a much yellower colour than natural. There was an ounce or two of clear water within the ventricles, and several masses of lymph of a yellow colour. The choroid plexus was very pale in colour, from the blood within its vessels being of a very pale red colour, much flattened, and streaked with a number of white lines; and in various

places there were a number of white points, about the size of a pin's head.

The communication between the lateral ventricles was enlarged. In the third and fourth ventricles there was also a small quantity of water. The glandula pituitaria was neither enlarged nor indurated, but had more of a yellow tinge than usual. There was a very small quantity of blood in the veins or sinuses of the head.

The coats of both vertebral, and both internal carotid arteries, were, for the space of an inch, of a brilliant yellow colour, very thick, and tougher than usual.

Abdomen.—The omentum majus and minus were much loaded with fat. The stomach was of a large size, its coats very thin, and much distended by air. The pylorus felt thicker than usual, and the liver was much enlarged, and of a deep yellow colour.

Of Organic Derangements of Membranes of the Brain.

Having already described the various seats of the effused fluid, and the consistence of the brain when water is lodged within the ventricles of that organ, it yet remains to describe the organic derangements of the membranes of the brain, and the nature of those tumours which are occasionally found attached to the surface, or are imbedded within the substance of the brain, in cases of Hydrocephalus.

There are several characters which are common to the disorders of the nervous system, an observation which may be extended to the morbid appearances discovered upon the examination of the bodies of those who have

been the victims of such disorders. Some of these organic derangements are frequent, but others are comparatively rare.

In order to throw further light upon the subject, I shall insert, together with an account of the organic derangements, the histories of a few of the cases.

1*st*, The dura mater has been described as having been occasionally found *in a state of inflammation, in cases of hydrocephalus.* I have seen it a little thickened, but never of a red colour, or lined with coagulable lymph; and this thickening I have found to be most considerable in the vicinity of the superior longitudinal sinus. When the dura mater has been reduced to such a morbid state, its inner surface frequently seems dry, as also the corresponding surface of the arachnoid coat.

2*d*, *Small and thin layers of bone* are frequent upon the dura mater, and its process the falx; but I have never seen them in the tentorium cerebello-superextensum, or in that part of the dura mater which lines the base of the skull. These pieces of bone seldom exceed the thickness or size of the nail of the finger; but sometimes they have attained not only a greater thickness, but also a much larger size, of which the subjoined case affords a striking example.

A boy, about seven years of age, who had been for some time afflicted with epilepsy, was killed, by falling out of a window upon the pavement. Upon dissection, a piece of bone, the surface of which had somewhat of a granular appearance, about four lines thick, five inches long, and two inches and a half broad, was found under the dura mater, adhering, by a newly-formed and

very vascular membrane, to the subjacent membrane, which was considerably thickened. The brain, in this instance, was softer, and of a paler colour, than is natural. There was a good deal of turbid fluid at the base, and also within the lateral ventricles of the brain, which were considerably enlarged, and especially the posterior cornua, and also the fourth ventricle.

3*d*, *Tumours of a dirty yellow colour, and of a hard consistence*, and of very different sizes, sometimes grow from the inner surface of the dura mater, or of its falciform process. Some such tumours do not exceed the size of a small pea; others are as large as a chesnut.

These tumours are generally uniform, but sometimes lobulated, on their surface; and, when divided, are found to be composed of a solid substance, of the same colour as their outer surface, in the centre of which there are no vessels to be seen. These tumours are covered by the inner layer of the dura mater.

4*th*, *Small vascular tumours* are sometimes attached to the inner surface of the dura mater.

There are two specimens in the Museum of the University, in which several small vascular solid tumours, of different sizes, are attached to the inner surface of the superior longitudinal sinus; and in one of the specimens, that sinus has been obliterated for the space of four inches. The patients died with symptoms of hydrocephalus.

Dr HOOPER has described and represented (see Plate VI.) a vascular tumour, about the size of a small apple, which grew from the inner surface of the dura mater;

externally it is of a purple colour, and in structure is said to be similar to the placenta *.

5th, Fungous tumours sometimes grow from the outer surface of the dura mater; these, after injuries of the head, will fall to be considered in the Second Volume. They destroy the superincumbent portion of the skull, and create an external swelling under the skin of the head.

The thickening of the arachnoid coat is a very frequent morbid appearance, when water is lodged between it and the pia mater; such a morbid appearance is not uncommon in the bodies of those who have died from typhus fever, palsy, spasmodic and convulsive affections, and mania. Thus the membrane loses its natural transparency, and assumes somewhat of a grey or milky colour.

In some instances of hydrocephalus the surface of this membrane looks dry, and has not its healthy glistening aspect.

I have also seen small and very thin layers of bone upon this membrane, when water has been accumulated within the ventricles of the brain.

The distension of the veins of the pia mater is the most common morbid appearance in various organic diseases of the head, and is most obvious in the part of the head which is undermost, and is, I presume, referable to the position of the head subsequent to death.

Air has sometimes been found within the veins of this membrane.

The *pia mater has occasionally been inflamed*, when water has been collected within the ventricles of the brain.

* Vide Illustrations of the Morbid Anatomy of the Brain.

It is very difficult to discriminate between the mere accumulation of blood within the vessels of this membrane, and an inflammation of it. Dr BAILLIE has most justly observed, "It is more difficult to distinguish this condition of it from its natural state, than any other membrane of the body."

"This depends upon the great number of vessels which naturally ramify on it. In inflammation, these small vessels are much more numerous than in its natural state, are filled with a florid blood, and form by their anastomoses a beautiful network. It does not frequently occur, when the pia mater is inflamed, that it becomes so uniformly red as to shew no interstices between its vessels *."

Small scrofulous tubercles are not unfrequently attached to the pia mater.

My colleague Dr ALISON has given a very perspicuous account of the nature of this disease, and of the consequences to which it gives rise. He has made particular mention of the co-existence of tubercles and water in the ventricles of the brain †.

It may not perhaps be improper to state, that Dr BARON has observed, "that tubercles, and the disorganizations to which they lead, *are not the product of any species of inflammation*; and that, although inflammation may attend their growth, and modify the symptoms they occasion, yet it is very different, both in its origin and consequences, from that which attacks a part unaltered by previous disease,—being, in the former case, the consequence, and, in the latter, the cause, of altered texture."

* Vide BAILLIE's Works, edited by Mr WARDROP, vol. ii. p. 379.

† Vide his interesting paper in the Transactions of the Medico-Chirurgical Society of Edinburgh, vol. i. p. 419.

A similar opinion has been adopted by BAYLE and LAENNEC as to tubercles of the lungs, and by ANDRAL, in respect to those of the intestines.

According to LIEUTAUD, small hydatids are sometimes connected with the pia mater; but I have never met with these in such a situation.

Of Tumours of the Brain.

Tumours are more frequently found within the brain than within the cerebellum, in the acute hydrocephalus; but I have never seen them in the chronic form of the disease, or in the brain of quadrupeds, though these animals frequently die from an accumulation of water within the head.

The most common kind of tumour found within the brain, is very similar to that which is sometimes attached to the dura mater, and which has been already described at page 45. The only other peculiarity is, that they are very intimately incorporated with the substance of the brain; and they grow not only to the surface (see Plate IV.), but also within the substance of the brain; and a number of vessels surround the edges of the tumours, and then pass into it.

These tumours are sometimes found softer in their centre than externally.

The *second* kind of tumour *is the scrofulous*, and is represented in Plate I. fig. 3. This tumour adhered to one of the lateral sinuses; and in order to shew the appearance of its surface and situation, I removed the brain. I took it from a child of a very scrofulous habit of body. The skull-cap adhered very firmly to the dura

mater, which was thicker than usual, and was separated from it with difficulty. The veins of the pia mater were much distended with blood. There was an effusion of water beneath the pia mater. The brain was softer, and much more readily torn than usual. The lateral ventricles, which were filled with a limpid serum, were considerably larger than usual. After removing the brain and cerebellum, a tumour about the size of an olive, very unequal on its surface, presented itself, (Vide Plate I. fig. 3.)

The surfaces of the omentum, and of the peritoneum, covering the intestines, and lining the abdominal muscles, were studded over by a number of yellow coloured tumours, which were somewhat of an uniform figure and size. A quantity of water was found in the abdomen.

The mesenteric glands were considerably enlarged, and filled by a matter of the consistence and colour of new-made cream. The liver, though of the healthy colour and structure, projected about three inches beyond the edge of the thorax, and was united by unnatural adhesions to the diaphragm. There was a good deal of water in the pericardium; the lungs were very much diseased, and adhered very intimately to the side.

Dr HOOPER has given an excellent representation of a scrofulous tumour of the cerebellum, which he has stated was composed of a quantity of apparently unorganised cheesy substance, intercepted by portions of membrane *. This kind of tumour sometimes passes on to ulceration, which has all the characters of other scrofulous ulcers.

* Vide his Illustrations of the Morbid Anatomy of the Brain.

Dr MONCREIFF was so polite as to furnish me with the three following cases, which explain more fully the nature of the disease and its combinations.

" April 25. 1823.—J. D,—— ætat. two, was, on the 25th April, affected with general anasarca, but apparently without any pain; the swellings subsided under the use of calomel and digitalis. In a few days after, he was attacked by symptoms of hydrocephalus, and died on the 15th May.

" *Dissection.*—Very small quantities of coagulable lymph here and there between the tunica arachnoides and pia mater; the former membrane, slightly thickened in some places, over the posterior part of the brain, and where it covered the tuber annulare, thickened to a very extraordinary degree. On the inferior part of the left hemisphere of the cerebellum, *was a scrofulous tumour, about the size of the pigeon's egg, containing soft curdy matter.*

" The cerebellum below was softened,—the sheath of the optic nerves was inflamed,—the ventricles were distended with fluid but the quantity could not be ascertained.

" May 29. 1823.—J. C——, ætat. three, has always been a weakly child; for three weeks past he has complained of headach, and inability to bear the erect posture. The headach has now very much increased,—frequent picking of nose,—subsultus tendinum,—grinding of teeth,—seems to hear, but has not spoke since yesterday,—passes his urine involuntarily,—bowels constipated,—pulse 120, sharp. Tongue white, pupils dilated. A purgative clyster was ordered,—a powder composed of calomel and rhubarb, and leeches to tem-

ples. On the 30th, the symptoms seemed to be increased, the medicines had produced no effect. The purgative medicines were repeated,—a blister applied to the nape of neck, and mercurial ointment rubbed into the thighs. On the 31st he was rather better, but pulse quicker and smaller. Had passed a small quantity of blackish matter by stool. A draught of castor-oil, with oil of turpentine, was ordered, and a blister to be applied over the head. On the 2d, in the morning, he appeared to be sinking,—slight degrees of salivation. Died at 8 o'clock P. M.

" *Dissection, June* 3.—Bones of cranium perfectly united,—several adhesions of dura mater to brain,—considerable turgescence of vessels,—between five and six ounces of fluid in ventricles. The cerebral substances surrounding the ventricles, especially the posterior part, very much softened, in some places quite pulpy. The substances of the cerebellum a little softened throughout. The left lobe contained *three tumours about the size of nuts, of a firm caseous consistence, excepting towards the centre*, and adhering to the dura mater, which, in that situation, was firmly attached to the bones. The other viscera were not examined."

" Master S. S. S., ætat. seven, when at school in England, about eighteen months ago, was pushed over by one of his companions, and fell flat on his face, and his nose was contused, but did not bleed. No immediate bad symptoms appeared, till he came home, about six weeks after, when he became very much debilitated, languid, and inactive, with anorexia, and great inclination to lie a-bed, and the recumbent posture ; was seized with head-

ach, not referred to any particular part, nausea and vomiting, with diarrhœa. Tonic medicines, nourishing diet, and change of air, were recommended. September last (1811), I first saw him. He appeared to be very weak, had a great heaviness about his head and eyes, and his limbs were very feeble. From this he went to Dunkeld, and his sight got gradually dimmer; except this, no material change took place for some time, till the scarlatina came into the house where he lived, and he was removed a few miles farther up the country, where he was seized with an epileptic fit, and continued insensible for about twelve hours: when he recovered from the fit, it was found that perfect amaurosis had come on, and that *he had paraplegia of his inferior extremities.* After this time he was subject to frequent screaming: when asked the cause, sometimes said that it was nothing; at other times, that it was his head, but did not refer the pain to any particular part. His sleep became disturbed,—was observed to pick his nose much,—complained of pain in the axillæ. His mental faculties were perfectly acute. He was again brought down to Dunkeld, and the medical attendant there ordered repeated blisters to the occiput and nape of neck, which always gave him temporary relief. He, however, became still weaker, and it was thought advisable that he should be brought back to Edinburgh, in order to have the benefit of more medical aid. He returned here accordingly in February last (1812), when the late Dr GREGORY was called in. His prognosis was very unfavourable; he thought that the only chance the boy had of recovery, was by taking a course of mercury, which was taken internally in form of the common mercurial pill, one night and morning,

for a fortnight, and then only one pill at night for a week; and about the bulk of a nutmeg of the ungt. hydrarg. fort. rubbed on his thighs every night,—salivation was produced to a great extent in about a fortnight, and lasted for about three weeks; however, it had no effect on the disease, and the symptoms gradually became aggravated. Dr GREGORY ordered nothing else, except when requisite, senna tea, oleum ricini, or enema purgans. He now considered the case hopeless. The boy's pulse became very quick, intermitting, and irregular; two days before death, it was 144, fæces and urine were passed involuntarily,—deglutition became difficult, with convulsions of the muscles about the mouth, and he was at times in a comatose state; when free from coma, his mental faculties remained quite entire. He continued in this way till the 15th of this month, April 1812, when he died.

"*Dissection*, on the 17th April 1812.—On taking off the skull-cap, the bone was found to be very thin,—slight turgescence of the vessels of the dura mater, and there was very evident fluctuation,—the substance of the brain was soft, and in some places seemed as if broken down,—the medullary matter was uncommonly white. *The ventricles were very much distended, and, when punctured, a great quantity of limpid serum rushed out*, which was carefully collected, and afterwards measured, and found to amount to *twelve ounces apothecaries' weight.* There was a cartilaginous tumour about the size of a bean, lying over the decussation of the nervi optici. On removing the tentorium, the right lobe of the cerebellum was found in a complete state of ulceration, somewhat similar to the scrofulous ulceration found in the lungs, in cases of

phthisis pulmonalis. Dr GREGORY was of opinion that the disease originated from the blow on the head."

The 3d kind of tumour, which is occasionally, but rarely, met with, is the *adipose tumour:* it has been so named from containing a portion of fat, but the quantity of this substance is not so great as in the steatom, so that it does not float on the surface of spirits.

This tumour has a solid appearance, and, when divided, is found to be composed of an aggregation of small lobules, which have a yellow colour. No vessels can be seen passing through it.

The adipose tumour of the brain has been described by the Messrs WENZEL*:—" Tumor exterius lævis erat, colore luteo, ejusque pars inferior, plane libera et soluta, in quadam ovata, admodum ampla, in cerebro depressione sita erat, cujus margo interior majori processui falciformi propius adjacebat.

" Persecantes tumorem, intrinsecus inveniebamus quamdam adiposam, subcineream, admodum solidam substantiam, quæ parvo quodam loco tactu velut ossea erat.

" In ventriculo tricorni ejusdem lateris tumor ille nihil vitiosi, quantum quidem oculis assequi poteramus effecerat; non solum enim immediate supra ipsum, sed etiam in eo ipso omnia reperiebantur illæsa, et conditione plane naturali. Ingens, quem ipsi examinavimus cerebrorum humanorum numerus, exhibuit duo cum scirrho; totidem cum adiposo tumore, et unum cum parte cerebri aliqua ossificata."

* Vide De Penetitiori Structura Cerebri, p. 104.

The 4th kind of tumour which has been occasionally found within the brain, is a *vascular, lobulated, and fungous tumour*; its component lobes are of different sizes: and when divided, its section is porous.

A tumour of this kind, about four inches long and two broad, was found by my Father in the anterior part of the right hemisphere of the brain: it adhered to the supra-orbitar plate. Before death, the patient was afflicted by acute headach, accompanied by pain on motion and stupor, but without convulsions or palsy of any part.

The 5th kind of tumour has, on account of its hardness, been called *scirrhous*.

This tumour is to the touch hard, has an irregular surface, and, when divided, somewhat resembles a section of the kidney. Being externally vascular, a number of cartilaginous striæ may be observed passing through the substance of the tumour.

Seven specimens of this kind of tumour are preserved in the Anatomical Museum, presented by my Father to the University.

In the first case, the scirrhous tumour was found in the brain of a girl, of nine years of age, who died from hydrocephalus.

In the second, the scirrhous tumour was found within the substance of the right ventricle of the brain. This patient died likewise from hydrocephalus.

The third and fourth cases exactly resemble the second, but of the exact seat of the tumour I am not aware.

In the fifth case, the tumour grew from the cerebellum. The patient died from hydrocephalus.

In the sixth case, the tumour adhered to the left

side of the falx. This patient also died from hydrocephalus.

In the seventh case, the right hemisphere of the brain was said to be scirrhous, and of a dark colour. The patient had long laboured under acute headach and epilepsy, and at length died from apoplexy. Upon dissection, the ventricles of the brain were found much dilated and filled by water.

In such tumours the internal structure is sometimes found much softer than the external.

A 6th kind of tumour which is occasionally met with in the brain, is of *the colour and consistence of clotted blood;* somewhat soft and elastic to the touch; it sometimes grows by a broad, and at other times by a narrow, base from the brain.

This tumour bears a very near resemblance to the disease called Fungus Hæmatodes. A specimen of this description is preserved in the Museum of the University. The patient, a young man, had suffered from headach, nausea, shivering, and pain over his body; to relieve which he had been bled and blistered in the nape of the neck, and had also repeated purgatives. He had occasional pain above the eyebrows, and his sight somewhat impaired. Both pupils were considerably expanded: they contracted on exposure to vivid light. The patient, for some time before his death, complained much of headach, which was somewhat relieved by blisters. He lived in this state during six weeks; and, on the day before his death, he had an epileptic fit, after which he fell into a state of stupor, and died in the course of a few hours. The following were the appearances on dissection: The skull very thin, and diseased;

dura mater unusually vascular; the brain felt unusually hard; half an ounce of limpid fluid was found in the ventricles; the choroid plexus very pale; tumour, about the size of an orange, grew from the middle lobe of the right hemisphere; and the brain around it was as soft as a pulp; the part of the skull on which the middle lobe rests is carious. The tumour had a vascular coat, and was divided into cysts, lined by very vascular membranes. The tumour was in some places cartilaginous, but in others as soft as custard.

Encysted tumours of a still more hard description, which *consist of cartilage*, or of a mixture of cartilage and bone, are occasionally lodged within the brain; and these sometimes have attained a considerable size. They are covered by a dense membrane like the pleura, and are very irregular on their surface, owing to a number of nodules of different sizes; and, when a section is made of the tumour, it is found to contain cells. MECKEL *, GREDING †, and BREGNY have described such tumours.

Dr TYSON ‡ has made mention of the case of a man, who received a severe blow upon the head with a bottle, which occasioned acute headach and vomiting, which were succeeded by a loss of sight and memory, by convulsions and stupor. He survived but a short time. Upon dissection, a great deal of water was found within the ventricles of the brain, and also a chalky substance, about the size of a nutmeg, in the substance of the brain, which was sphacelated.

Tumours of a cartilaginous nature have sometimes at-

* Ludwig Adver. Med. Pract.

† Zodiac Gallic. Obs. xiv. p. 81.

‡ London Phil. Tran. vol. xix.

tained a very considerable bulk. I removed one from the brain of a girl eighteen years of age, who, about three years before her death, had received a violent blow on the head. In this case, the tumour was covered by a very soft and disorganised portion of the brain, which was very soft, and of purplish colour; (Vide Plate IV.) The dura mater was also eroded. The tumour was as large as a common orange, very hard to the touch, and irregular on its surface. It was divided with great difficulty, and within it were found five or six small cysts of an irregular figure, and also several small portions of bone. The dura mater was thickened and inflamed, and several cauliflower-like excrescences grew from it.

7th, *Encysted bony tumours* have been sometimes found within the substance of the brain.

Such tumour is somewhat similar to the preceding, the cartilaginous substance which forms the greater part of the 6th kind of tumour, being the nidus in which the bony substance is deposited.

This tumour is generally small and very irregular on its surface, and imbedded within the substance of one of the hemispheres of the brain.

I received from the late Mr A. Burns of Glasgow, a cast of a tumour of this description, which was imbedded in the substance of the brain of an old man who had died from apoplexy. It was very irregular as to its form and surface, and weighed 1 ounce and 2 scruples. This tumour did not, in the slightest degree, resemble those bony tumours, which, from their resemblance in hardness and colour to ivory, have been called Ivory Tumours, which sometimes have been found in the brain.

As far as I have observed, the formation of this ivory-

like substance is much more frequent in the bones of the extremities, and in the articular surfaces of these bones, than in the skull.

In the Museum my Father gave to the University, there are seventeen specimens of such ivory-like bony matter on the articular surfaces of the bones of the extremities, and but two specimens of such a substance growing from the skull.

Dr SIMSON of St Andrew's met with a very remarkable instance of a mass of bone within the skull of a cow *. It is stated, "the beast was falling away in flesh, and was more dull than ordinary, though going about with all its senses, and the only visible disease else, was a breathlessness which disturbed her in her sleep."

Small masses *of a calcareous nature*, have not unfrequently been found within the substance of the brain.

8th, *Melanosis of the brain*, by which is meant an encysted soft tumour filled by a fluid which, in colour, resembles Indian ink, is sometimes met with in the brain, to which it adheres loosely, excepting where the vessels enter it. I do not pretend to affirm that I have met with such tumours when water has been accumulated within the brain. Dr HOOPER has given a representation of this disease in his 12th Plate, Figs. 2. and 3.

This kind of tumour, when situated in other parts of the body, is of a blackish or dark brown colour, is usually of a small size, irregular on its surface, and some-

* Vide an Inquiry how far the animal and vital actions can be accounted for independent of the brain. Edinburgh, 1752.

times united to other tumours of a similar description, so as to resemble a bunch of blackberries. To the touch it is soft, and when compressed, the blackish fluid is squeezed out.

This disease is sometimes combined with fungus hæmatodes of the eye. About twenty years ago I met with the disease in the liver, and subsequently in the lungs, and still preserve the preparations alluded to. And in a subsequent year, I met with a number of cysts in the mamma, which were filled by a fluid exactly resembling the ink of the cuttle-fish in colour and consistence. A large cyst, of an oval form, and about two inches long, which communicated with two or three smaller cysts, was presented to the University of Edinburgh by Dr HOME, in which this remarkable disease was common to the skull, orbit, vertebræ, ribs, clavicle, pleura, pericardium, peritoneum, heart, lungs, liver, spleen, kidneys, omentum, and eye. In this case, some of the tumours had narrow necks, and some were of a purplish, others of a brownish, and others of a deep black colour. The brain was natural in appearance; but there were several minute striæ, of a dark colour, in the course of the smaller vessels of the brain, and a quantity of serum under the arachnoid coat, and also within the ventricles of the brain *.

Those tumours which occur after fractures of the skull will be afterwards described.

I lately received from Sir JAMES M'GRIGOR the fol-

* A particular account of this disease has been given by Dr CULLEN of this city, and by Mr CARSEWELL, in the Transactions of the Medico-Chirurgical Society of Edinburgh, vol. i.

lowing important document, which will be read with great interest, as it not only gives an excellent account of several kinds of tumours connected with the brain and its investing membranes, but also of their concomitant symptoms.

"No. 1.—A portion of dura mater, with a number of scrofulous tubercles attached to its inner surface, taken from John ————, who was admitted into hospital for epilepsy, to which he had been subject for many years; he complained of constant pain over the right temple and ankles,—latterly he became comatose, and died, having been eleven days in hospital.

"No. 2.—A tumour, about the size of a lemon, of a soft and fibrous structure, attached to the inner surface of the dura mater, near to the longitudinal sinus, and which was lodged in the substance of the brain, removed from William ————, ætat. thirty-four, who was admitted into hospital, with a tendency to stupor, confused ideas, and contracted pupils. On the ninth day after admission, he became comatose, and died.

"No. 3.—A tumour of a cartilaginous texture, and about the size of a hen's egg, attached to the inner surface of the dura mater, and removed from the head of Serjeant ————, who was admitted into hospital with paralysis of the left side, torpor, impaired intellect, and debility. For the two previous years he had been subject to epilepsy, which was attributed to a fall he sustained in India. In the commencement of the disease the pupils were dilated, but towards the termination they be-

came contracted. He died, being one month in hospital; and, on examination, the tumour above described was found lodged in the right hemisphere of the brain.

"No. 4.—Two tumours of an irregular spongy texture, which were attached to the inner surface of the dura mater, and pressed upon the middle lobe of the right hemisphere of the cerebrum, taken from the body of an officer who died at Cephaloma of enteritis. Previous to his death he had no cerebral symptoms whatever.

"No. 5.—Three spongy tumours, invested with regular capsules, and each about the size of a pigeon's egg, taken from the brain of C—— C——, of the Waggon-Train, who was admitted into hospital at Cambray, labouring under amaurosis and deafness. After two years' stay in hospital, he became affected with fever, of which he died; and, on examination, the above described morbid deposits were detected.

"No. 6.—A tumour, about the size of a hen's egg, invested with a capsule, and in structure like unto moistened cork, taken from a child who had laboured under symptoms of hydrocephalus for more than two years.

"No. 7.—Dura mater, exhibiting a deposition of lymph, about two lines in thickness, in the situation of the great longitudinal sinus, taken from William P—— ætat. twenty-four, who, after an attack of fever, had suppurating tumours formed on the scalp and sternum,

—was suddenly seized with pain in the epigastric region, and dysenteric symptoms, under which he sunk in three days. On examination, the cranium was found partially absorbed in the situation of the ulcers, and the dura mater separated from the cranium, to the extent of the disease above described.

" No. 8.—A portion of dura mater, exhibiting its outer surface coated with flakes of coagulable lymph, removed from C——C——, ætat. fifty-three, who had served many years in India, when he became affected with epilepsy. On his arrival in England he had an attack of fever, which ended in derangement of the mental faculties. In this state he was admitted into the lunatic asylum, the epileptic paroxysms became more severe and frequent, in one of which he suddenly expired. On examination, the serous system of the brain appeared more turgid than natural, and the dura mater in the region of the left temporal bone presented the appearance above described.

" No. 9.—Dura mater, exhibiting irregular perforations on either side of the longitudinal sinus, taken from Thomas ————, ætat. forty-one, who was admitted into hospital for hepatitis chronica, contracted in Ceylon. Four days before his death he became comatose, and, on examination, portions of the inner table of the frontal bone were found absorbed, an abscess situated in the right hemisphere of the brain, and the dura mater in the state above described.

" No. 10.—Dura mater, exhibiting ossification in the course of the great longitudinal sinus, taken from the

body of a creole, who went to bed, complaining of a slight headach, and was found dead in the morning."

Encysted abscesses have sometimes been found within the brain, when there is water within the lateral ventricles *.

A very instructive instance of this disease was sent to the Museum of the University, by Dr ALISON.

There was a large abscess in the right hemisphere of the brain, and the dura mater over part of that hemisphere was covered with pus, and detached from the cranium. The pericranium corresponding was destroyed, and the bone bare. There was a considerable discharge from the external ulcers. The bone was thickened, and of a dense texture, not carious.

The patient, aged forty-nine. The disease in the bones of the head was of an year's standing before death. He had previously suffered from syphilis, and had the marks of scrofulous sores.

He was treated for severe pleurisy a few weeks before death, and recovered well. He had no pain of head, palsy, forgetfulness, or delirium; forty-eight hours before death, he became drowsy, and, twenty-four hours before death, comatose, with dilatation of the right pupil and stertor.

Ulcers bearing all the characters of other scrofulous ulcers, have been found within the brain. In one of my preparations there is a distinct scrofulous ulcer in the upper surface of the brain, the margin of which adhered to the tentorium, and between this and the hollow ulcer, there was a quantity of ichorous fluid.

The substance of the cerebellum was considerably *in-*

* In the Second Volume, a full account of these abscesses will be given.

durated, and also more vascular than usual. A considerable quantity of water was found within the lateral ventricles. A portion of the frontal bone, equal to about 2 inches square, was studded over with small projections.

The patient had laboured under epilepsy, which was followed by palsy of the left side (the ulcer of the brain was on the opposite side), followed by the usual symptoms of hydrocephalus, terminating in mania *.

Caries of the temporal bone is sometimes connected with ulcers in the brain, and water within the head.

Tumours of the brain are also frequently connected with a diseased state of the skull, independently of those which are occasioned by external injury.

I had occasion to see a very striking illustration of this disease in the person of a lady, twenty-seven years of age. In the year 1798, she observed a swelling on the fore and anterior part of her arm, for which she could assign no adequate cause.

The swelling gradually increased, and at length attained the size of a goose's egg, and it became extremely painful, which she compared to that of burning, and this stretched from the fore part of the fingers up to the wrist. There was an obscure fluctuation in the tumour, but no pulsation, and the fore finger was benumbed. On the 17th of June 1801, the tumour was opened, and ℥ii. of a bloody water were discharged. After the water had been evacuated, a soft substance was observed in the bottom of the cyst like clotted blood.

The tumour was afterwards extirpated, and the radial nerve was found incorporated with the back part of it.

* A further account of abscess and ulcers of the brain will be given in the second volume.

The sore healed in about a month, and she continued well until March 1802, when the tumour returned, and increased rapidly to a great size, and from it a fungus grew out.

The arm was amputated in 1802, and the radial nerve was carefully examined both above and below the tumour, and was found connected with it by many threads very like nerves.

In January 1804, this lady was seized with acute headach and shivering, soon after which a tumour, the size of a chesnut, appeared over the left eye-brow, and the eye-ball was protruded. Soon afterwards she died.

I regret much that I was not permitted to examine the body fully. The relations would permit me only to cut into the tumour, which was found to be of the medullary kind; and the os frontis under it was carious, and completely eroded, so that the little finger could be passed through it, when the brain was found to be in a pulpy state.

This imperfection in the dissection is in part supplied by the subsequent case, which occurred to my uncle Dr DONALD MONRO, and which is subjoined in the words of the author.

"On examining this tumour, I found that it was two fingers' breadth in diameter, and rose about half an inch above the skin of the rest of the forehead; that it had an evident pulsation, and immediately on pressing it he complained of pain, and of a giddiness of his head; which complaints he said he was often attacked with, on making any quick motion. On feeling the tumour with the fingers, and pressing alternately on the edges and middle part, one could easily perceive that there was a hole in the bone, below the middle of the tumour; and

that round it there was a rising of the bone, and that it was rough and carious."

"On raising the skull there was found situated on the fore part of the left hemisphere of the brain a tumour, the size of a China orange, the substance of which appeared like the medullary part of the brain, and it was doubtful whether it did not take its rise from thence; and it was now discovered that it was part of this tumour which had protruded forward, and made its way through the skull, and formed the external swelling on the forehead. The hole in the os frontis was so large as to allow the fore-finger to pass through it; the part of the tumour which was without the skull was covered with a membrane; part of which seemed to be the dura mater; the skull round the hole was swelled, and a little carious and rough on the outer surface*."

Lastly, It may be observed in respect to tumours of the brain, that, according to the statement of these accurate anatomists the Messrs WENZEL, tumours of the brain are much more frequent in this country than in Germany; they have stated, that, out of the great number of brains they had examined, they had met with only two examples of scirrhous, and a similar number of adipose tumours, and one of an osseous tumour; whereas, according to the Records of the New Town Dispensary of this city, there were eleven instances of tumour out of sixty-two cases of hydrocephalus that were examined.

Professor BURNS of Glasgow informed me by letter, that spongiod tumour of the brain has not always

* Vide Med. Trans. published by the Royal College of Physicians of London, p. 353-354.

the exact appearance delineated by Dr HOOPER. It has been in distinct masses, none larger than a small chesnut, of an appearance somewhat like jasper. In one case this was combined with a large spongiod tumour on the jaw, and another on the breast and on the hip *.

In several of the cases above enumerated, mention has been made of the morbid appearances which have been met with in the chest and abdomen.

I shall therefore content myself merely by stating, that I have occasionally met with water in the chest and pericardium, diseased heart, or lungs, diseased liver, spleen, mesenteric glands, and ascites.

The intestines have occasionally been found in a state of intus-susceptio, or partially inflamed.

Lumbrici have been occasionally found within the intestines.

* The patient, an elderly lady, complained of occasional feeling of fulness in the head, and constant pain and weakness of her back. A tumour appeared on the upper part of the right breast, and another on the left hip; and an elastic tumour was found next on the gum, which was opened, but nothing else than blood came out. Now she felt numbness in the left arm and leg, and her weakness increased. She became drowsy, moaned much, and, if raised, screamed as if in pain. When raised in bed, she complained of being giddy, but had no pain in the head, and her mind continued clear, till at last the tumour on the gum had become fungous.

Several tumours were found in the brain as large as hazel nuts, and very like to coagulable blood, but, when cut out, they appeared mottled like jasper, and of a rough grain: in some places they contained opake vascular-looking specks of lymph; in others, darker little spots, like cavities filled with black blood. I can only infer them to have been spongiod tumours, from the nature of the other tumour ascertained to be spongiod, and, having three of the same kind externally, it is fair to think they were of the same.

CHAPTER II.

OF THE DIFFERENT KINDS OF HYDROCEPHALUS, THEIR SYMPTOMS, PROGNOSIS, AND METHOD OF TREATMENT.

From the preceding statement as to the morbid appearances of the brain, it is obvious that the skull is not invariably enlarged or altered in form, when water has been accumulated within it.

SECTION I.

OF HYDROCEPHALUS, IN WHICH THE SKULL RETAINS ITS USUAL SIZE AND FORM.

Of this kind of hydrocephalus, there are two very different species, or rather varieties. The one is decided in its character at the outset, very rapid in its progress, proving fatal in three, four, or five days, is very rare, and has not been described by any author with whose works I am acquainted;—the other is frequently obscure in its origin, is much slower in its progress, being generally of three, four, or five weeks' duration; is very frequent, and has already been described by many at great length.

OF THE MOST ACUTE SPECIES OF HYDROCEPHALUS *.

This rare form of the disease is very sudden in its attack. There is no previous headach, drowsiness, stupor, nausea, vomiting, paralytic state of any part of the body, or any one symptom denoting a derangement in the functions of the nervous system.

It begins like the croup. The child awakes in the night in a state of extreme agitation, and much flushed, and with a quick pulse; he is hoarse, and the sound of the voice when he inspires is similar to that in croup,—the sound seems to come from a brazen tube, which is contracted at a certain part.

Children who are stout and healthy, are equally liable to this disorder as the feeble and emaciated. And I have seen a patient, on the very day he was attacked by this disorder, who seemed very cheerful, and took his meals well, and was to all appearance in the most perfect health.

The giving an emetic relieves the breathing, and, upon examining what has been rejected by vomiting, it is found to be evidently undigested.

* When this sheet was about to be sent to press, I learned from Professor BURNS that he had described, in his Principles of Midwifery, this very acute form of hydrocephalus, which he attributes to an affection of the origin of the eighth pair of nerves, induced by the state of the extremity of the fifth in dentition acting on its origin, which is near the eighth. The recurrent seems more immediately in fault, producing a temporary paralysis of the muscles of the glottis rather than a spasm. It by no means ends necessarily in hydrocephalus, but it sometimes does, as, after the child has been apparently well for weeks or months, he is carried off by hydrocephalus, which change is first indicated by general convulsions. Few children recover when the original attack is accompanied with convulsions, yet the case is not altogether hopeless.

In further illustration of the nature of this very acute and fatal kind of hydrocephalus, I have subjoined the following cases.

On Sunday evening, January 2. 1820, about half past 10 o'clock P. M., a stout healthy boy, twenty months' old, awakened suddenly from his sleep, which had previously, to all appearance, been very quiet, as in a fright; he immediately coughed violently, and his cough had a peculiar hoarse sound, like that of the croup. He breathed with difficulty, and quickly. He seemed very uneasy, his skin was rather hotter than usual, he was very thirsty, and was very unwilling to lie down again; his pulse was about 150 in the minute, and rather hard. During the preceding part of the day (which, it may be remarked, was intensely cold), he was, to all appearance, in the most perfect health and spirits,—he took his breakfast and dinner as usual, ran about a great deal, singing, as he used to do, very frequently, and had an airing in a carriage for about half an hour. In the course of the day he had two stools, which were in colour, consistence, quantity, and smell, natural.

Under the impression that his disease was the common inflammatory croup, to which his family were very liable, about 11 o'clock P. M. he got a tea-spoonful of a solution, in which one grain of emetic-tartar had been dissolved in ℥i. of water, and at a quarter past 11 o'clock, a similar quantity, and at half past 11 o'clock a third tea-spoonful. The emetic operated slightly, and he vomited a quantity of a viscid ropy mucus, mixed with a little bile, and some small pieces of turnip and carrot which he got for dinner, at 2 o'clock P. M., *which were not changed in any respect.* About a quarter before 12 o'clock Mr BRYCE saw him, along with me,

who, conceiving ipecacuanha to be safer than the solution of tartar-emetic, prescribed eight grains of that medicine.

About 1 o'clock A. M. he was put up to the middle of the body into tepid water, and kept in it for five minutes. The child continued to vomit occasionally till 4 o'clock in the morning, discharging a good deal of slimy mucus. When desired, he put out his tongue, and it was observed to be very white, dry, and clammy.

As soon as the vomiting had subsided, three grains of calomel were given, which were retained. The child fell into a quiet sleep, between 4 and 6 o'clock A. M. of Monday, at which time a large blister was put upon the larynx, which sliped down and stuck upon the middle of his breast-bone. The blister rose well in the usual time, and a good deal of watery fluid was discharged from it; part also of the blistering ointment had got down over the region of the stomach, which produced vesication of that place.

As the three grains of calomel had not produced a stool by half past 8 o'clock of the Monday, a desert-spoonful of castor-oil, mixed with brown sugar, was prescribed, but the child only took a little of that medicine.

About 9 o'clock the purgatives produced the desired effect, and in the course of three hours following, the child had four more stools, which the nurse reported to be rather offensive as to smell, and the last stool was of a green colour.

On Monday morning, January 3, at 9 o'clock A. M. I visited this patient along with Mr BRYCE. The child seemed more lively, his countenance had brightened up, he was less flushed, breathed less frequently, his voice was stronger, and he repeatedly sang and laughed, nam-

ed his mamma and papa, but his voice was still husky. There was evidently considerable defluction in his breathing, and, as generally happens with children of his age, he did not spit out the expectorated fluid, but swallowed it.

It may be remarked that he occasionally started, not only when awake, but also when asleep. He continued to be tolerably easy, until between 4 and 5 o'clock of the same day, when his skin became hotter, he was more thirsty, and his breathing was more affected; he was extremely restless and uneasy. To alleviate these symptoms, he was bathed in warm vinegar and water, and got another dose of calomel, which seemed to relieve him, after which he slept occasionally for an hour; but his voice was still husky, and his breathing and pulse were quicker than natural, and his countenance was more flushed; but, on the whole, he passed comparatively a quiet night, always sleeping, as he did when in health, on his face and belly.

On Tuesday morning, January 4, he continued nearly in the same state, but between 4 and 5 o'clock in the afternoon his skin became hotter than ever, and his expectoration more difficult, and his pulse evidently rose. He was at this period very thirsty, and drank occasionally a good deal of barley-water, which he asked for, or desired, by a sign, to be taken away from him. At 10 o'clock the same evening, his pulse was about 200 in the minute, and remarkably hard and sharp; he breathed (to use his nurse's phrase) very hard and fast, and with difficulty, but rather like an asthmatic than a croupy patient, for the sound did not seem as if it had passed through a contracted aperture, nor had it the brassy sound which is so characteristic of the inflammatory

croup, and his countenance was much flushed, and expressive of much suffering. In consequence of its having been hinted to his mother, that his symptoms might be owing to teething, Mr BRYCE examined his gums and found them much swelled and inflamed, and that the canine teeth on each side were about to cut the gum. In these circumstances, the gum on each side was freely divided, which seemed to give the child but little uneasiness, and there was a very slight discharge of blood, even though the gum over one of the grinding-teeth had also been cut. He now started much more frequently than heretofore. He continued perfectly sensible, and did all he was desired.

I conceived at this period of the disorder, that the disease was not the common croup. The disease was not in the windpipe, in which opinion Mr BRYCE also coincided, and added, that we had not discovered the cause of the symptoms.

On account of the remarkable quickness and hardness of the pulse, five leeches were applied to one of his legs, which was afterwards put into warm water: thus a good deal of blood was drawn.

Another dose of calomel (three grains) was prescribed. The child continued perfectly sensible, and made the usual sign to his nurse for the chamber-pot, and, as soon as he had seated himself, he had a free evacuation; the fæces were natural as to consistence, colour, and smell, and a larger quantity was discharged than might have been expected, considering the small quantity of food the child had taking during the preceding days.

About an hour after this, the breathing became rather easier; but still the child was evidently very much oppressed, which was strongly expressed in his eye. He was

also very restless, hot, thirsty; had a good deal of defluxion in his throat, which he could not readily get rid of; and he tossed much in bed, and evidently could not bear his head so low as before, and was, when considerably raised in bed, somewhat relieved.

I remained in the room with him until 6 o'clock on the Wednesday morning, and distinctly observed that he continued nearly in the same state during the whole of the time, excepting that I thought he breathed with still greater difficulty, raising his little shoulder-blades, and occasionally tossing his head backwards, and elongating his neck, to relieve the laborious breathing. As soon as it was day-light, the change in the appearance of the countenance was very obvious,—it was deathlike; the cheeks had lost their red colour, and were covered by a number of purple blotches; the lips were colder than natural, and of a leaden colour; and the nose, forehead, and chin, had a yellow, waxy, and bloodless hue. The lips were very dry, and glued together by a viscid matter, and, when separated, the mouth was filled with a dark brown coloured matter.

The breathing was now, if possible, still more laborious, and the child could not now expectorate, and his voice had entirely lost its croupy sound.

The pulse still continued quick, hard, and occasionally intermitted; still the child continued sensible, and frequently kissed his mother and nurse.

At 10 o'clock A. M. of Wednesday, 5th January, Professor HAMILTON and Mr BRYCE visited the child along with me. He was then extremely uneasy and restless, and could not bear the slightest degree of the horizontal posture.

His breathing was very quick and laborious. Pulse

still hard, and about 200 in the minute, and had very frequent startings, during which his fingers were convulsively contracted.

He was still very thirsty, and occasionally drank a good deal of barley-water. In consultation, it was thought advisable to apply several leeches to the limbs, which, on being put into warm water, bled freely.

With the view of promoting expectoration, the following mixture was prescribed. ℞. Æther. Nitros. ʒii.; Tinct. fol. Digital. gutt. xl.; Aq. Fontan. ℥iij.; Syrup. simp. ʒi.; Sig. mixture, of which a table spoonful is to be given every two hours. The medicine excited vomiting as often as it was taken, which, however, did not alleviate the breathing in the slightest degree. The face and lips were now more livid. About 1 o'clock, the child breathed with more difficulty. Both eye-balls were convulsively drawn upwards and outwards, and the cornea was somewhat opaque. The pupils were very much dilated, and insensible to light, and his feet were somewhat cold. He continued in this state till about a quarter past 5 o'clock P. M., when he expired, without the slightest convulsion of the muscles of his face, or any other part of his body, excepting of those of the fingers and thumbs.

Dissection, 12 hours after death.—The cavity of the abdomen being first examined, the intestines were found in their usual situation, of a white colour, and moderately distended with air. The stomach, which was much contracted, lay in the left hypochondriac region, exhibited a blanched appearance; and, when slit open at the lesser curvature, it was found empty, and its mucous membrane was uniformly healthy, and the rugæ were very distinct. The mesenteric glands were of their

natural colour, size, and consistence, and all the abdominal bowels. The large bloodvessels also were almost empty.

All the bowels of the thorax were sound.

The veins on the fore-part of the neck were quite empty; the trachea externally was of a silvery whiteness. An incision was made from the upper part of the thyroid cartilage into the division of the windpipe; the mucous membrane lining the larynx was of a white colour, and in every respect healthy. There was no appearance of the croupy membrane, no thickening, no ulceration, nor any mark of preceding inflammation. The trachea and branches of the windpipe, as far as they could be traced, were also healthy and free of mucus. The fauces and pharynx were also sound.

The *brain was large, firm, and healthy;* and the veins entering the sinuses were distended with dark blood. *The upper surface of the brain, particularly the superior part of the posterior lobes, was covered with a transparent gelatinous effusion. On opening the ventricles, about an ounce of colourless serum was discovered, which had raised the fornix considerably.* The medulla oblongata and tuber annulare were found floating on a great quantity of clear serum. The veins covering the tuber annulare and medulla oblongata were distended with blood, so that they exhibited a deep scarlet colour. All the nerves at their origin were sound, *except the fifth and eighth pairs, which were also of a deep scarlet colour, and covered with turgid vessels.*

On removing the brain, by cutting through the medulla oblongata, a considerable quantity of serum rushed from the upper part of the spinal canal.

The vessels of the spinal marrow were turgid, those at the cervical portion of a vermilion-red colour, and those of the lumbar portion of a dark red hue. *The eighth pair of nerves was of a deep uniform red colour along its whole tract, as far as its branches going to the lungs.*

This very acute form of hydrocephalus is not confined to children,—I have met with it in the adult, as in the subjoined case. This patient, a woman of sixty-five years of age, was very subject to spasm in her stomach, and to most obstinate constipation. She at length died very suddenly. I examined her stomach and intestines with great care, but could discover no morbid appearances in these. There was a very considerable effusion of a watery liquor, and also distension of the vessels of the pia mater over the eighth pair of nerves within the membranes, and at the base of the brain. It may be worth while to mention, that I remarked that a dog, whose par vagum had been divided, was affected in the same manner for ten or twelve days after the nerve had been divided.

About three months after I had seen the first case, I saw another instance of this disease with Dr SAUNDERS. The following are the notes I took on the occasion.

April 28. 1820.—J. B., æt. eight months, a plump stout child, became remarkably fretful, and would take no kind of food. Next day he was seized with slight cough and hoarseness, which gradually increased, and also with difficulty in swallowing; so that a part of his food, upon his endeavouring to swallow, was rejected through his nose. Pulse quick.

On the following day, the symptoms had materially abated, especially the cough, and he expectorated a good deal of viscid phlegm.

During the night, and still more during next day, he became much more uneasy; his breathing became more oppressed; and the voice was so hoarse and shrill, that several old women who saw him, said *he had the croup*. There was great heaving and agitation of the chest.

On the subsequent day, the breathing was very laborious, and much hurried; pulse very rapid, and between 120 and 130 in the minute; and next day he died.

Appearances on Dissection.—Skull very vascular. There was a slight effusion of serous fluid between the arachnoid coat and pia mater; and about ʒi. of a similar fluid was contained within the ventricles of the brain. *The vessels of the pia mater at the corpora quadrigemina and tractus optici, and at the origin of the eight pair of nerves, were much distended with blood.*

Lungs quite sound.

No morbid appearance was discovered in the larynx and trachea. A small quantity of mucus, which had more of a greenish hue than in the sound state, ran out on opening the windpipe, and there was some frothy mucus within the smaller branches of that tube.

The only morbid appearance in the abdomen was a very considerable enlargement of the mesenteric glands.

The symptoms in the preceding cases corresponded in my opinion with the phenomena which occur upon irritating the eighth pair of nerves of the inferior animals.

The croaking sound of the voice, and the difficulty in breathing, were probably to be imputed to the effects of the irritation, to which the laryngeal nerves had been

exposed, for the stretching or dividing these nerves in a living animal produces the same effects.

The functions of the lungs and stomach are suspended, from the irritation applied to the eighth pair of nerves, which also happens when these nerves have been divided. If the eighth pair of nerves of an animal be divided, and if that animal be allowed to take food soon after the division of the nerves has been made, vomiting in a short time ensues. Precisely the same took place in the child above described,—and the food is found to be unchanged,—which also happens in this form of hydrocephalus. In the case above mentioned, the vegetable substances which the child had taken in broth, *were indigested, though they had been within the stomach for twenty hours.*

In the child's case detailed in page 70, &c. the difficulty in breathing gradually increased, and the face became purple towards the conclusion of the disorder; and, upon examination after death, the air-tubes and cells of the lungs were found filled with a frothy fluid; and hence the lungs did not collapse. All which circumstances take place when the eighth pair of nerves of an animal have been divided.

In the cases above detailed, the difficulty in breathing was much increased by the effort of vomiting; and the same happens when the eighth pair of nerves of an animal have been divided.

There is another very striking analogy in the symptoms of the above case, and in those occasioned by dividing the eighth pair of nerves:—"If an animal," says Dr WILSON PHILIP, "be allowed to eat after the operation, the vomiting almost immediately ensues." The same took place in the first case above described.

My late pupil and friend, Mr SWAN, has lately published a case, in which symptoms somewhat similar were occasioned by the partial shrinking of the paria vaga.

"A gentleman, sixty-two years of age, who had been very subject to gout, was taken with great pain at the stomach, after eating a hearty dinner. He took an emetic, in consequence of which his stomach ejected a quantity of food, chiefly chicken, which, though it was full four hours after dinner, was not in the least digested.

"He began to have a difficulty of breathing, which was only perfectly relieved, either by a fit of the gout, or the vinous infusion of the colchicum root.

"When the difficulty of breathing was the worst, he made a whistling noise, as though the glottis was contracted. For some time he was quite free from it. The difficulty of breathing continued, with different degrees of violence, till the time of his death. He never had pain in the chest. His stomach remained in the same craving and insensible state to the last. His body for many months had been becoming more and more emaciated.

"A few nights before he died, he was taken with difficulty of breathing to such a degree, and seemed so exhausted, that some wine was given him, and galvanism was again tried. After the first ten minutes, the noise in his breathing left him, and he kept breathing more and more easily; so that, when the galvanism had been used for half an hour, he laid down, and slept better for several hours, than he had done for some time before. The galvanism was repeated the next day, and he thought himself relieved by it; but this relief was of

short duration, for his breathing soon became as bad as ever, and he died a few days after.

"On tracing (says Mr SWAN) the par vagum, from the middle of the neck, each nerve was flabby, *and much smaller than natural*, and felt like nerves removed from a putrid body after having been soaked in water.

"The branches distributed to the lungs appeared as is usual, as did the continuations of the nerves, nearly as far as the termination of the œsophagus, when they were found redder and thicker than usual, and had not a healthy appearance. The left nerve was smaller than the right*."

Of the Diagnosis.

It is of great moment to distinguish the above modification of hydrocephalus from the more common croup, and also from those other disorders in which the sound of the voice is much altered, and the breathing becomes difficult.

This disease is not dependent on the state of the weather, the residence of the patient, or any of the other predisposing causes of the croup; but is rather connected with the period of teething, and nervous irritation.

The following are the more remarkable distinctions between this disease and the common croup.

The patient, at the outset of the disease, seems in a state of nervous irritation, often starts in his sleep, and in a short time the disease assumes the appearance rather of a spasmodic affection of the larynx, than of the inflammatory croup; but there is not so much wheezing,

* Vide the valuable Treatise of Mr SWAN on the Nervous System, London, 1822, pp. 14 and 15.

and the disorder is not mitigated by the expectoration of ropy mucus, or by vomiting; and what is discharged by vomiting may be observed to be indigested.

The purple colour of the face is a striking feature of the earlier part of the croup, but it is not obvious in this disease until twelve or fourteen hours before death, and is probably owing, as in moribund animals, to a weakness of the muscles of inspiration.

The longer the duration of this disease, the less shrill and hoarse the voice becomes; whereas in the common croup the contrary takes place.

Coagulable lymph sometimes forms a distinct tube within the larynx and windpipe in the advanced stage of common croup, and may be perceived moving within it, which never happens in this disorder.

This disorder may be readily distinguished from inflammation of the lungs;—there is no cough, or pain in any part of the side or breast, which is increased by inspiration;—in proof of which, the first mentioned patient repeatedly sang during the progress of the disorder, and as loudly as when he was in the most perfect health. This form of hydrocephalus may be distinguished from the more common form of the disease; as the sight is not impaired, and there was no dilatation of the pupils, and little or no delirium.

Lastly, When the voice becomes weak or shrill, from any cause compressing the windpipe,—as by matter collected behind it,—by diseases of the bronchial or thyroid glands,—by aneurism of the aorta, or carotid artery,—or by any other cause compressing and straitening the windpipe, the alteration from the natural sound of the voice is permanent; whereas, from this disorder, it is but temporary.

Of the Means of Treatment.

Considering the very acute nature of this form of the disease, and the seat of the effused fluid, very little can be expected from human art.

At the very commencement of the symptoms, a large dose of calomel, together with the application of a number of leeches to the head, and a large blister to the back of the head and nape of the neck, or the application of caustic to the nape of the neck, seem to me to be the most proper remedies.

Professor BURNS observes, "I keep an issue open at the occiput for some time after apparent recovery."

OF ACUTE HYDROCEPHALUS.

Of the Symptoms.

Dr WHYTT is the first author who has given a full, distinct and accurate account of this form of hydrocephalus, which has of late been much extended, and rendered more faithful to nature, by Doctors CARMICHAEL SMYTH and YEATS.

The former of these authors has made many ingenious and just comments on Dr WHYTT's descriptions of the symptoms of this disease, of which I shall avail myself.

Various causes concur in throwing a veil over the earlier symptoms of this disease. The extreme youth of the patient is a great barrier to the detection of the nature of the disorder. Beside there are many symptoms

which are common to infantile remittent fever,—to dentition,—to worms,—and to a disordered state of the alimentary canal,—and also to hydrocephalus; or the remittent fever terminates in hydrocephalus.

There is no one pathognomic symptom of a collection of water within the brain*. The characters of the disease are deduced rather from a certain chain or combination of symptoms; and hence the nature of the disease may not be detected until it is beyond the reach of art, if the most scrupulous attention be not devoted to every the most minute symptom.

This is not the only source of difficulty: the disease is not uniform in its origin and progress, in different instances;—it is the sequel of a disordered state of the functions of the abdominal bowels;—and besides, as Dr CARMICHAEL SMYTH has justly observed, "The secondary or symptomatic hydrocephalus is always preceded by some other disease, of which it appears to be an immediate consequence; and the symptoms have so strong a resemblance or analogy, as frequently impose upon persons unacquainted with the complaint, or unaccustomed to accurate discrimination; and when the real hydrocephalus or watery effusion takes place, the symptoms of both diseases are so blended together, as to occasion much ambiguity and confusion;—owing to which many symptoms have been described as appropriate to hydrocephalus, that have no dependence or connection whatever with the disease."

It is proposed, in the first place, to describe the more

* Dr ABERCROMBIE observes, "We have no certain mark which we can rely upon, as indicating the presence of effusion in the brain. Slowness of pulse, followed by frequent coma, squinting, double vision, dilated pupil, and paralysis, we have seen may exist without effusion."

usual symptoms, and afterwards those deviations from these which have been occasionally observed.

The earlier symptoms are those of irritation, the latter those of oppression.

The early symptoms are generally so mild as to attract but little attention, and often escape the notice even of the parents of the patient. The disease is most frequent in persons of a scrofulous constitution, where there is little energy of the system, and little activity in the vascular system; or, it is either the consequence of some organic disorder of the brain, or its investing membranes,—or of such disorders as impede the free return of blood from the head, or the free circulation through the bowels of the chest.

The early symptoms of the more mild form of the disease, are, a sense of general uneasiness over the body, accompanied by languor, paleness, and collapse of the features; the eyes look languid, have not their usual brilliancy, and frequently are turned upwards; the child is peevish, which is strongly expressed in his countenance; the countenance has no longer the bloom of health; his head feels heavy, and the child, unwilling to run about, seems easily fatigued, and always desirous of lying down on the top of the bed. His appetite is bad, and capricious—and seems unwilling to take the trouble of eating, and there is often bilious vomiting.

If the child be old enough to express his feelings, he complains rather of a dull noise in his head than of acute pain, and this is increased somewhat on pressure. He is very restless in bed, and seems much disturbed in his sleep.

In a short time the symptoms become more urgent, the skin becomes very dry, and the lips are cracked.

There is a permanent lassitude; the bowels become torpid; the child complains of constant pain over the eyebrows, which are swollen, and of giddiness; nausea and sickness succeed. There is a total loss of appetite. The senses of vision and hearing are morbidly acute; the light is intolerable,—the patient turns away from it,—keeps his eyelids half-closed,—is awakened from his slumber by the slightest noise, and often starts from sleep screaming. He will not allow his pulse to be felt.

Many children suffer very little, if at all, from headach, at the commencement of the disease; and in those who have, we observe that there are remissions.

The headach is relieved in the earlier stage of the disease by purgatives.

The cheeks are much flushed, especially in the evening, and one cheek is frequently more flushed than the other; his nose is very itchy, and his tongue hot and dry. The patient awakes generally in a fright, and screaming; seeming to suffer excruciating headach, to relieve which, he clasps his hands on his head; even when not disturbed, he sleeps only for two or three hours at a time; he suffers from sickness, expresses disgust for every kind of food, and vomits especially when moved; and, as Doctors FOTHERGILL and QUIN have well observed, "the sickness and headach sometimes alternate with each other."

These symptoms are accompanied by heat of the skin, and quick pulse, amounting to 100 or 110 in the minute, and but rarely by thirst.

One of the most striking features of this disease, is a torpid state of the system;—salivation is not readily excited; nor does a blister rise well; and very considerable dozes of antimonial powder do not occasion even a slight degree of moisture on the skin.

The patient is costive generally, and is not easily moved by a purgative medicine.

The fæces have an oily appearance, sometimes a very fetid smell, are generally of a green or brown colour, somewhat like chopped spinage—which is not owing to calomel, as it is observed when no calomel has been given, and are in consistence somewhat like glue. Towards the conclusion of the disease, diarrhœa sometimes comes on to such a degree, that opium is required to check it.

The urine is sometimes retained for a longer time than during health, and there are also instances in which the little patient had a desire every hour to pass water; —and I attended a child afflicted by this disorder, who passed for some days very little urine; but within four or five days of his death, he passed fully as much urine as when in perfect health. Often the power of expelling the urine is completely lost, so that the regular use of the catheter is required.

The position and gestures of the child in bed, and the effects of motion, merit attention, being very characteristic of the disease.

A child with this disease cannot bear the erect position, or to be moved, evidently from the headach he suffers; he is tolerably easy only when in bed, and excluded from light. In the earlier part of the disease, he cannot sleep with the head low; he lies in bed with outstretched arms, which have a tremulous motion—are often directed towards the head, or firmly clasped upon it; he is constantly turning and tossing from one side of the bed to the other, as if he could not find an easy posture, and generally kicks the bed-clothes with one or both feet,

and very frequently groans much, as if under the influence of pain.

The gait of the patient is peculiar; he totters, and cannot walk with his usual firmness, one side of the body being weaker than the other; he lifts his legs very high, and takes long steps of unequal length, like a paralytic person. This is a bad symptom, and generally connected with disease at the base of the brain.

In the progress of the disease, the sleep is still more disturbed, and the breathing becomes more irregular and difficult. The breath, according to Dr WHYTT, has a sickish and most offensive smell, which he never had observed in any other disorder.

There are also generally symptoms of a derangement in the functions of the alimentary canal. Dr CARMICHAEL SMYTH has remarked, "Their abdomen is commonly flat, and compressed in a manner I have seldom observed, except in persons affected with the painter's colic."

The tongue is foul; sometimes it has a shining red appearance, or it is covered with aphthæ.

There is much variety as to the severity of the symptoms, which merits much attention, as demonstrative of the cause of the disease, its seat, and as regulating the prognostic, and mode of treatment.

Dr ABERCROMBIE has observed*, when "the effusion was combined with that peculiar destruction of the central parts of the brain, which I have given my reasons for considering as the effect of inflammation of these parts, there has been severe and deep-seated pain."

The combination of the above symptoms, the morbid sensibility as to light and hearing—great irritability of temper—the head hotter than the rest of the body, and

* Edinburgh Medical Journal, July 1818, p. 272.

often covered by a clammy perspiration, sufficiently mark this disorder in its early stage.

After the disease has been of a few days duration, the pulse, which had been quick and irregular, sometimes becomes slower than in health, and also irregular; which, according to Dr WHYTT, marks the second stage of the disease.

Of the Second Stage.

Dr WHYTT had the merit of directing the attention of medical men to the very variable condition of the pulse, which is no uncommon feature of the progress of this disease. He has therefore described three stages of the disease, the second being characterized by slowness of the pulse.

In this stage, the pulse is commonly not only slower than it was before, but often more so than in health, and at the same time unequal, and irregular as to strength, and the interval of the strokes. But though the quickness of the pulse be abated, the skin continues to be hot, and, indeed, rather more so than in the first stage.

During the second stage, the symptoms above enumerated increase in severity, and the patient cannot bear the sitting posture even for a short time.

There is a want of correspondence in the movements of the eyes at this stage of the disease; a degree of squinting may be observed; one of the eyes is directed towards the nose, or sometimes in the contrary direction, and some say they see objects double.

In this advanced stage of the disease, the patient's sufferings are evidently more acute; he groans more

frequently, gnashes his teeth, and loathes every kind of food; violent vomiting sometimes occurs; the headach is so acute as to create violent screaming.

The urine sometimes deposits a copious sediment, but in other instances no sediment whatever. About this period of the disease, some patients experience a temporary remission from the more marked symptoms, upon which the relations flatter themselves that the patient is convalescent; but in a few hours a relapse takes place, and the patient falls into what has been called the Third Stage.

Of the Third Stage.

This last stage may be called the state of collapse; the brain is much oppressed; the child, who previously had been extremely irritable and peevish, falls into a state of drowsiness or stupor, and the body frequently is to the touch colder than in the healthy state.

The third stage, according to Dr WHYTT, is characterized by regularity and still greater quickness of the pulse, amounting, on some occasions, to above 200 in the minute.

This state of the pulse, says Dr WHYTT, "occurs six or seven days before death."

The duration of the third stage is very various, sometimes it does not exceed ten or twelve hours; but, on other occasions, it lasts for several days. The child is unable to turn the head, or to move the body from its place, he generally sinks down in bed, lies on one side or his back, with the limbs, or one limb, somewhat drawn upwards, and is insensible to all irritations, and very drowsy.

One side of the body is frequently paralytic, and it must be considered as a very bad symptom, as affording strong evidence of the existence of some organic disorder of the brain.

The eye-lids frequently fall down to a certain degree over the pupil, and, on raising them, the cornea seems muddy, being obscured by mucus and a greyish film, and the pupil is much enlarged.

The natural sensibility of the eyes being lost, the patient sees indistinctly or double; and, indeed, all the senses, except that of hearing, are evidently much blunted. The body becomes very much emaciated.

Sighing is a very common symptom in this stage.

The discharge from a blister applied to the head is remarkably fetid; and I have known it occasion sloughing to a considerable degree at this period of the disease.

These symptoms are followed by dilatation of the pupil, even in a vivid light, and the pupil of that eye which is directed towards the nose is generally larger than the other.

But the pupil of some patients is not dilated, but contracted,—a distinct proof of extreme blindness and insensibility of the retina.

This state of the pupil was noticed many years ago by my Father, who used to observe, when speaking of it in his Lectures: "Dilatation of the pupil is a motion performed by the power of instinct, as much as the contraction is, and we exercise it in a remarkable degree on some occasions, on account of the use which the dilatation is found to serve. I have seen in two or three cases of hydrencephalus, that, when a patient was roused by bringing a strong light close in upon the eye, instead of

finding the pupil contract, I observed it dilated to a great degree." Dr WHYTT gives a case of this kind, but he is mistaken with regard to the cause of it. It is not from any general irritation, bringing on a convulsive motion, for the motion is regular; but, in this situation, the eye being more insensible than common, requires a quantity of light, and the patient at the instant is making the effort of seeing; and being taught that the contraction of the pupil would have a contrary effect, he dilates the pupil.

The iris does not act like a spring in the dilatation, for, as the circular fibres contract it regularly, the longitudinal must act in the same regular manner. To confirm this, I shall add an observation I have repeatedly made in cases where the pupil was dilated, that, "immediately after death, the pupil was contracted, shewing plainly that its dilatation had been owing to a living muscular power."

The pupils, after having been dilated for a time, become contracted. In some cases, the pupil seems, for a few hours, insensible and contracted, but afterwards it contracts and dilates.

Delirium is a frequent symptom at this period of the disease, and it comes on suddenly, not slowly, as in fever.

Towards the fatal termination of the disease, the muscles of the face and extremities are frequently convulsed; the thumb and fingers are strongly bent inwards; and the pulse is not to be felt at the wrist.

The pulsations of the heart become more feeble and frequent, it flutters rather than beats,—the pupil remains fixed and open,—one side of the body is, in some cases, affected with spasm, whilst the other is paralytic,

and I have seen so great a degree of twitching of the flexor muscles of the fingers, that it was very difficult to count the pulse.

The skin is besmeared by a viscid and cold sweat.

The breathing becomes quick and laborious; the sphyncter muscles of the bladder and rectum become paralytic; the urine and fæces are involuntarily passed in bed, and the patient loses the power of swallowing even liquids.

His limbs become cold, and he falls into a comatose state.

I have, however, seen a patient outlive the coldness of the extremities for several days. I had occasion to visit a child, whose pulse was not perceptible at the wrist, and whose feet and legs became cold, at least a dozen of times, before he died. The coldness was removed by the application of hot flannels and friction, and by giving cordials.

The respiration becomes still more laborious, interrupted and stertorous, convulsions in various parts of the body, and death, soon follows.

Before death a degree of tetanus sometimes comes on. I met with an instance in which the patient's head was much drawn backwards,—his feet were turned inwards.

The duration of the disease has been stated differently by different authors.

According to Dr FOTHERGILL, the disease runs its course in three weeks; whereas, according to Dr WHYTT, it lasts for four, five, or six weeks. GOLIS observes, "The greater part of my hydrocephalic patients (of which the number amounted to some hundreds), when they died, did so between the 13th and 17th days; none before the 8th; and only a few after the 24th or 30th day. Expe-

rience also teaches, the earlier or later occurrence of death depends on the greater or less irritability of the brain—*on the slow or rapid collection of the effused fluids*—on the degree of vehemence in the exciting causes—on the use of more or less appropriate remedies."

Of the peculiarities in the Symptoms.

There are many anomalies as to the symptoms of the disease.

1st, I have seen several instances in which a considerable quantity of water had been collected within the ventricles of the brain, and in which these ventricles had been considerably enlarged, notwithstanding which, there were no peculiar symptoms which indicated its presence.

Dr QUIN has described a case, in which there was no aversion to light, and no dilatation of the pupil, excepting in the last day of the disease; the pulse was at first slow and unequal, it afterwards became quick, and in the end again became slow and irregular. And, in another case, there were such intermissions as to the pulse, that bark was prescribed.

2dly, The disease sometimes begins by repeated convulsive fits, or by a spasmodic contraction of the extensor muscles of the head; by which it is forcibly drawn backwards, and kept so until a day or two before death. This symptom was so strongly marked in two cases, that the mothers of the patients recognised the disease in another child, from the peculiar manner in which the head was drawn backwards; so that the disease somewhat resembles tetanus, but the head was

not so rigidly drawn back as in that disease, for it might be bended forwards; but as soon as the hand was taken away, the patient drew it back again.

These convulsive fits were the first symptoms of derangement in the functions of the system which attracted the attention of the parents, and which led them to seek for medical aid.

Squinting is sometimes observed about the beginning of the disorder; and the pupil is much dilated, and has somewhat of a reddish colour.

In some cases there is no affection of the pupil during the whole course of the disease.

The disease sometimes commences by sleepiness.

Excessive costiveness is on some occasions the primary symptom of this disease.

I attended a gentleman of twenty years of age, along with my Father and the late Dr GREGORY, in whom extreme costiveness of a month's duration was the primary symptom of this disease. He had no passage for twenty-two days, although very large doses of the most drastic purgatives were prescribed.

Six months afterwards he became extremely confused, complained of acute headach: his pulse was slow and irregular, it fell to 48 in a minute; after which it became small, quick, and irregular. He squinted in a remarkable manner, the pupil became dilated, and he lost his sight. He died in the course of a few days.

On dissection, between three and four ounces of clear water were found within the ventricles of the brain, and a slight effusion between the membranes of that organ. The viscera of the abdomen and thorax were quite sound.

It may be observed, that, when convulsions occur after the disease has been of some duration, one side of the body is evidently paralytic; but the leg and arm of the opposite side can be freely retracted and used, whereas, when the convulsions occur at the very commencement of the disease, or amongst the earlier symptoms, both legs and both arms are equally convulsed.

It sometimes happens, that persons afflicted by hydrocephalus are seized with hemiplegia, and die in the course of a day or two. Upon dissection, three or four ounces of water are found in the ventricles of the brain.

The disease sometimes begins like acute rheumatism, and the symptoms of disease in the brain do not shew themselves until three or four days before death.

I had occasion to visit a boy twelve years of age, who laboured under this disease, who did not complain of pain, but of extreme coldness in his head, to remove which he sat constantly before the fire.

An inflammation in the tunica adnata of the eye has been said by Drs WHYTT and WATSON sometimes to occur a day or two before death.

It very often happens that the pulse does not become slow during the progress of the disease.

In some instances, there are no symptoms of irritation, but merely those of compression, as insensibility, coldness of the head and extremities, slowness and irregularity of the pulse, and in the breathing.

A day or two before death, I have seen the little patient recover his senses, and take his food, so that the parents expected a recovery; but, of a sudden, the symp-

toms of effusion came on, which were speedily followed by convulsions and death.

My Father has observed another peculiarity. "But, in some cases of hydrocephalus internus, in which the retina seemed to have very little sensibility, I have seen the pupil remarkably dilated when the eye was exposed to a bright light; and, when the light was removed, it was sensibly lessened."

Squinting is by no means a constant symptom.

There are instances in which the disease has terminated favourably after convulsions, blindness, and delirium had taken place, and when the patient had been supposed to be dying; and, what is very remarkable, even the sight has been regained *.

There are examples of children, and also of adults, who have been attacked at different intervals by heaviness of the head, in some cases amounting to acute headach, accompanied by great depression of spirits, which was very strongly depicted in the countenance, costiveness, and pain in the nape of the neck.

These symptoms are followed by impaired vision, and so great a degree of vertigo, that the patient could not walk without staggering.

The above symptoms are not constant, but come on in paroxysms, and become in time still more urgent; the headach becomes still more acute; the breathing quick; the pulse becomes slow, accompanied by moaning in the sleep.

In consequence of the more frequent return of these

* See Willan's Reports of the Diseases of London; and Watson's Medical Observations and Inquiries, vol. iv.

paroxysms, during the intervals of which the patient seems in apparent health, and in the full enjoyment of all his mental faculties, the patient's strength becomes much exhausted, and he dies after having been afflicted in this manner for the space of eight or ten months; and, upon dissection, several ounces of water are found within the ventricles of the brain.

Some patients have no degree of sickness or vomiting during the whole progress of the disease.

Some patients continue sensible during the whole progress of the disorder, excepting for a few hours before death.

The recovery of the sight and hearing may be enumerated amongst the peculiarities of hydrocephalus which sometimes occur.

The late Mr BRYCE informed me of the case of a lady, æt. 15, who died of hydrocephalus, who, during the whole progress of the disease, had neither sickness nor headach. Her pulse was regular, and did not exceed 80 in a minute.

She continued sensible during the whole progress of the disorder, and died suddenly after having conversed with her friends.

Children labouring under hydrocephalus are usually very languid, and unwilling to move in bed; but the very last child I attended with this disease, was in the habit of starting from its sleep, jumping up in bed, and placing itself in a sitting posture.

Difficult deglutition is a symptom of the third stage of the disease. I have seen it go off, after it had existed to such a degree, that the fluid evidently stopped at

the cardia, and, by doing so, excited a good deal of coughing.

Some patients, even in the last stage, give a decided preference to some articles which are given to support life. I have seen a child take freely wine and water who rejected soup, milk, or melted jelly.

There are instances of recovery where no very active medicine has been employed, and even when convulsions, delirium, and blindness had taken place; and the patient got well not only from the water in the head, but also even recovered his sight *.

Of the Cause of the Effusion of the Water.

This point merits the most particular attention, as it regulates the mode of averting and of curing the disease.

According to Dr QUIN, "the disease in question always owes its origin to one cause, viz. to a morbid accumulation of blood in the vessels of the brain, sometimes proceeding to a degree of inflammation, and generally, but not always, producing an extravasation of a watery fluid." In page 51. he has observed, a morbid effusion of serum was discovered after death in the ventricles, and between the membranes of the brain, accompanied by the most unquestionable proof of uncommon distention, and violently increased action of its bloodvessels.

Drs RUSH, YEATS, and GOLIS of Vienna, also consider the disease as proceeding from inflammation and

* Vide CHEYNE, p. 64.

turgescence of the brain, which the last-named author says, he has discovered upon dissection, as also coagulable lymph within the ventricles of the brain.

Before subscribing to such hypothesis, which must influence so much the diagnosis, prognosis, and mode of treatment, it is necessary to inquire, whether this disease usually occurs in persons who are disposed to inflammatory disorders, at or near to the meridian of life, when the human body is most liable to suffer from inflammatory diseases.

With regard to the first of these points, it may be observed, that hydrocephalus is so rare after puberty, when the constitution is most liable to inflammatory disorders, that Dr CULLEN *, and other writers of eminence, have described it as being peculiar only to infancy. That the disease is rather to be imputed to debility follows from the well known fact, that hydrocephalus is frequently a disease which may be traced to bad nursing, improper food, dentition, the sequel of the most tedious and debilitating disorders, as hooping-cough and scarlatina. Besides, hydrocephalus is often a disease of the fœtus in utero, which nips the bud before or soon after it is blown; for the child dies soon after birth, after having made a few laborious and convulsive respirations.

If Dr QUIN's theory had been well founded, hydrocephalus, like an inflammation of the lungs, and other inflammatory complaints, should have been most prevalent amongst robust men during the prime of life, when the human frame is most prone to other inflammations;

* See his Definition of the Disease.

whereas it is a disease of infancy, of debility, and very often connected with a scrofulous habit of body. If it be supposed that hydrocephalus is always connected with inflammation of the brain, and that inflammation gives rise to the softening of that organ (which is the favourite opinion of LALLEMAND, ROSTAN, and others), in that case, the brain should be found invariably in a softened state, which is not consonant to my observations. *

Dr MILLS of Dublin has published twelve cases of hydrocephalus, several of which appear to have been connected with inflammation of the brain, but no mention is made of softening of the brain; on the other hand, in one of these, the brain is said to have *been harder* than natural.

Dr HOOPER, at page 23, in his explanation of his Plate representing inflammation of the brain, has observed "a pulpy state of the part *is now and then met with.*"

Dr WATSON also has described a case in which the septum lucidum was of an unusual thickness and firmness.

If hydrocephalus had originated from inflammation, it should have been more frequently the *immediate* consequence of external violence. Whereas Dr CHEYNE observes: "With extensive opportunities of seeing hydrencephalus, I have *not met one instance* of its having been directly, and I believe only one where *it was indirectly, occasioned by external violence*;" and when (as sometimes happens) it originates from such a cause, the effect does not follow until months or years have elapsed, and when a debilitated action of the bloodvessels has

* Vide Case described at p. 42, in which there were marks of preceding inflammation.

been induced by the violence, just as palsy is sometimes a consequence of external injury, which palsy is followed by dropsy.

If inflammation of the brain had given rise to this species of hydrocephalus, the attack of the disease should be sudden and well marked, and its course rapid, like to that of phrenitis; whereas the origin of the disease is generally not well marked; indeed, so much so, as often to escape the notice of the parent, and even that of the experienced physician.

It may here also be observed, that I have made experiments upon several rabbits and pigs, with the view of determining this question, but though I excited inflammation of the brain by trepanning the skull, and cutting off a portion of the dura mater, the effusion of a watery fluid within the head did not follow.

It is admitted even by those who impute hydrocephalus to an inflammation of the brain, that the symptoms of phrenitis are well marked, whereas those of hydrencephalus are often very obscure; indeed, in some cases, there *is no one symptom indicating the effusion within the head.* I have met with four cases in which a watery fluid was collected within the ventricles of the brain, and in all of these there were none of the symptoms during life which led to the most distant suspicion of water being lodged within the ventricles of the brain.

If this species of hydrocephalus be owing to an inflammatory state of the brain, there ought to be no distinction as to the symptoms, origin, progress, and consequences of phrenitis and hydrocephalus.

Inflammation of the brain is thus defined by Dr CULLEN: "*Pyrexia vehemens; dolor capitis; rubor fa-*

ciei et oculorum; lucis et soni intolerantia; pervigilium; delirium ferox, vel typhomania."

The symptoms of this species of hydrocephalus do not correspond with the above definition.

One of the most striking features of inflammation of the brain, is the state of the pulse; but that character is also awanting, for the state of the pulse is widely different from that of a person afflicted by apoplexy or inflammation of the brain. It is not full, as in the former, or hard, as in the latter. It is no doubt quick, as in other diseases which are the effect of debility; in the same manner as the pulse rises after a great deal of blood has been drawn.

Beside, no one author who has described the symptoms of phrenitis, has stated *that the pulse becomes slower some time after the commencement of the disorder;* and, on the other hand, bleeding from the eyes, mouth, bladder, and intestines, which are so frequent during phrenitis, have seldom or never been observed to occur during the progress of hydrocephalus. If hydrocephalus depended upon a slight degree of inflammation, the disease would be more frequently cured.

There is a great difference between the watery fluid which is effused in this species of hydrocephalus, and that in the former most acute species which is connected with inflammation. The latter is turbid, and masses of coagulable lymph shoot through it, and it resembles water accumulated within the abdomen in cases of dropsy of the belly, originating from peritoneal inflammation. Whereas the former is as clear as spring water; and as BELLINI, BOERHAAVE, DU HAEN, MALPIGHI, Drs

WATSON, CARMICHAEL SMYTH, and COINDET remark, the effused fluid does not coagulate by the application of heat or the mineral acids.

The analysis of the hydrocephalic fluid by Dr TRAILL*, is highly in support of the opinion I have advanced. At the first tapping, no coagulable matter was found in it, as the fluid had not been derived from the vessels of an inflamed surface; but after tapping the brain, which had probably induced a certain degree of inflammation, the nature of the effused fluid was materially altered; it then contained a certain proportion of coagulable matter. Another singular circumstance regarding the secretion from serous membranes is, that the surface of the arachnoid coat, which covers the brain, has, in some cases of hydrocephalus, been observed to be very dry, whilst the vessels of the other part of the same membrane which lines the ventricles secrete a morbid quantity of fluid; so that we must suppose either, that, if the inflammation be the cause of the effusion, it has been limited to that portion of the arachnoid membrane which lines the ventricles, or that inflammation produces different effects in different parts of the same serous membrane.

The remarks which have been made respecting the symptoms of hydrocephalus, apply also with respect to some of the other causes of the disorder.

An inflammation of the brain is frequently the immediate sequel of exposure to the rays of the sun of a tropical climate, or of external violence.

But water in the head is not occasioned by similar causes, nor is the disease more frequent in warm than

* Vide page 7.

in cold climates, like phrenitis,—nor is it the immediate effect of external violence,—nor of trepanning the skull, and afterwards injuring the brain of an animal; a fact which I have learned, by repeated experiments on rabbits.

Injuries of the head, no doubt, sometimes give rise to hydrocephalus, but the effect does not immediately follow the cause; *the fluid is not effused until after the lapse of several months or years*, when the vessels have become debilitated, in consequence of the previous over-excitement. (To employ Dr CHEYNE'S own words), "By calling into play, what, from a good and fortunate management, had hitherto become latent; I mean, *a scrofulous condition of the system, which I have regularly observed to follow a severe accident, and which wonderfully favours the establishment of hydrencephalus.*"

Some advocates for the opinion that hydrocephalus originates from inflammation of the brain, have imputed the disorder *to a fault in the digestive* organs.

But a fault of the digestive organs, so far from adding to the vigour of the constitution, produces a very contrary effect, and, by diminishing the vis vitæ, tends to avert or to remove a disposition to inflammation.

The morbid appearances most frequently discovered on dissection, are generally hostile to the hypothesis, that hydrocephalus acutus is connected with inflammation.

The pia mater very seldom exhibits, in cases of hydrocephalus, those appearances which, according to the late Mr J. HUNTER (a very competent judge), are the genuine marks of inflammation.

That distinguished surgeon has observed (p. 281.),

" When inflammation takes place in parts that have a degree of transparency, that transparency is lessened. This is probably best seen in membranes, such as those membranes that line cavities, or cover bodies in those cavities, such as the pia mater, where, in a natural state, we may observe the bloodvessels to be very distinct. But, when we see the bloodvessels *fuller than common, yet distinct in such membranes, we are not to call that inflammation.*"

There is no part of the body in which it is so difficult to make the distinction between the presence or absence of inflammation, as in the pia mater.

The pia mater did not bear, even according to Dr QUIN, all the characters of genuine inflammation,—it was not thickened,—it did not adhere ultimately to the substance of the brain, as in cases of inflammation of that organ. According to that distinguished pathologist Dr BAILLIE, " when the pia mater is inflamed to a high degree, pus is formed."

Dr QUIN does not state that he discovered pus upon examining the state of the brain of persons cut off by hydrocephalus.

Besides the thickening of serous membranes, as the dura mater and arachnoid coat, a preternatural adhesion of these generally follows the inflammation of these membranes. The result of my post-mortem examinations is, that, in a very few cases only, there were appearances of preceding active inflammation.

It may be argued by the advocates for an inflammation of the brain being the invariable cause of hydrocephalus, that the slightest degree of inflammation of that organ, or of its investing membranes, may not be appreciable

by our imperfect senses; in the same manner as we cannot suppose (as has lately been stated), that there is no difference in the purity of the air in the centre of London, and that at the top of the Malvern hills of Worcestershire.

There is no one point more difficult to determine, whether a morbid accumulation of blood really exists; and *granting that it does exist, whether it be connected with inflammation or not?*

Until the precise caliber of the bloodvessels shall be ascertained, it is quite impossible to say when blood can be said to be accumulated in these vessels. Blood, when accumulated in the bloodvessels, must occasion an enlargement of these, which does not suddenly happen.

Inflammation is not the necessary concomitant or sequel of an accumulation of blood in the bloodvessels, the eye, for instance, often acquires a red colour, though the pulse be not accelerated, and though there be no degree of pain in the eye or forehead, and no degree of impatience of light, or any other symptom of active inflammation.

The vessels of that part of the brain which was lowest, were, in *many instances, fuller of blood than those of the uppermost part of that organ, which evidently is connected with the position of the head rather than with inflammation.*

As the different advocates for the opinion, that hydrocephalus is connected with inflammation, have published very different statements as to the kind and degree of the inflammation, it does not seem to me to be against the rules of evidence, to suppose, as it is so difficult to distinguish the genuine characters of inflamma-

tion, that, in some of the instances, *no degree of inflammation had existed.*

There are other arguments against the hypothesis of Dr QUIN.

The same mode of treatment has not been recommended, as in other diseases of an inflammatory origin.

If hydrocephalus originated from inflammation, it should be generally removed by the lancet; whereas Dr QUIN, and the advocates for his theory, recommend leeches in preference to the lancet, for it has been said (and truly), *that such patients do not bear large bleedings well, and that the disease is seldom cured by such treatment.*

The bleeding by leeches having been premised, mercury is next recommended by the advocates for Dr QUIN's theory, as being an efficacious remedy. But, if this disorder originates from inflammation, mercury is a very improper remedy. Mercury is a stimulant, not a sedative. When given internally, it increases the action of the heart and arteries, the secretion of the skin and kidneys, and salivary glands, and is accompanied by local inflammation of the mouth, sometimes by ulceration of the gums, velum pendulum palati, and tongue, and a very irritable state of the whole system; and, farther, the blood drawn from a person under the influence of mercury, exhibits the same buffy coat, as that of a patient labouring under a pleurisy.

Mr CARMICHAEL of Dublin has well observed, that "mercury induces a specific fever different from all others, and attended with an increase of the various secretions."

Mercury is not recommended in any stage of phrenitis or pleuritis, so that, in this instance, the practice

is not consonant to the theory; besides, the mercury seems calculated to counteract the supposed beneficial effect of the bleeding by leeches.

Of the identity between hydrocephalus and dropsy there is at least presumptive, if not positive, evidence.

There is an analogy between the cause of hydrocephalus and dropsical disorders. Hydrocephalus, like dropsy, more frequently originates from debility than from inflammation, and is a frequent disease of infancy,—a period of life when the human frame readily bends under the pressure of every cause, which enfeebles the power of the constitution, as of long continued fever, scarlatina, phthisis pulmonalis, marasmus, measles, whooping cough, and diseases of the liver, spleen, and mesenteric glands.

Dr HAMILTON senior has justly observed, "that hydrocephalus often steals slowly on the devoted victim, with symptoms resembling incipient marasmus."

Till some better theory is established, it is not unreasonable to suppose, that *the marasmus of which I have treated, may, on some occasions, give rise to hydrocephalus, by impairing the vigour of the constitution, and favouring serous effusion in the ventricles of the brain.*

It may be added, that MORGAGNI* has mentioned the case of an elderly woman, which strongly illustrates the great influence of debility in producing hydrocephalus; it is said, "she sank progressively to her grave, as under the pressure of age."

The detraction of blood has sometimes occasioned dropsy of the abdomen or chest. The same observation may

* Vide COOKE's edition, vol. i. p. 18.

be extended to hydrocephalus, of which the subjoined case is an example.

"A—— R——, three years old, had been seized with croup, for which a great number of leeches had been applied repeatedly to his throat, and blisters to his back, and calomel had been prescribed; by which remedies he got well in a few days.

"A fortnight afterwards, I was told by his mother, he became excessively peevish, complained of acute headach, his eyes were dull, heavy, and sleepy; his skin was hot, his pulse very quick and irregular, and he lost his appetite. Four leeches had been applied to each temple, each temporal artery had been opened, and a blister had been put on the head. But notwithstanding the above remedies, the patient was not relieved. My advice therefore was requested.

"When I visited the boy, I observed, that, in addition to the symptoms above enumerated, his pulse was quick and irregular, his skin hot, and his eyes were very heavy; he could not bear the light, and he squinted. There was a puffy tumour, rather larger than a crown-piece immediately over the eyebrows; and the occipital lymphatic glands on each side were considerably swollen. His body was open, and his stools were of a green colour, and very fetid.

"In these circumstances, I directed the whole head to be covered with a blister, composed of tartar emetic and hog's lard, and that he should take, every fourth hour, a powder composed of two grains of calomel and three grains of James's powders. The following reports of the case were drawn up by my pupil Dr FILKIN, who visited the patient along with me.

"*Thursday morning, July* 26.—Passed a very rest-

less night; two or three dejections, of a green colour, passed in bed; strabismus of the right eye very distinct; puffy tumour of forehead rather diminished; skin hot and dry; pulse frequent and irregular; is very peevish and cries a good deal; has not taken any of the powders, nor has the ointment been applied.

"Past 8 P. M.—Patient lying, as he has done nearly the whole day, in a comatose state; may be roused, but it requires some effort to confine his attention for more than a minute, and, if left to himself, soon returns to his comatose condition; complains of his head less than he did a few days ago; has taken three of the powders since morning; three or four copious green stools; ointment has been applied twice; strabismus as before; pulse and skin as mentioned in last report.

"*Friday morning, July* 27.—Passed a restless night; two powders taken; two dejections as before; ointment applied once; some pustules on back part of the head; less strabismus; puffy tumour of forehead, and swelling of occipital glands continue; pulse rather more regular.

"*Sunday, July* 29.—Has passed a better night. His father informed me that he awoke during the night, and found that the child had got up to go to stool; two dejections of less green appearance; pulse about 106, regular; copious discharge from the head; puffy tumour increased this morning; skin cool and moist; picks his nose a good deal; scratches his legs and back, where the sinapisms were applied, very much; is now quite sensible. His mother has not observed that he had ever any convulsive affections.

"I ordered his body to be sponged with vinegar and water once or twice a-day.

"*Monday morning, July* 30.—A pretty good night; is now sitting up in bed; three stools since last visit, of a green colour, and having a very fetid smell,—none of them passed in bed; pulse regular; skin cool and moist.

"0 P. M.—Patient asleep; pulse 116, very regular; coughs much at times, but this he has been accustomed to do since he had the croup; pupils contract and dilate regularly; skin cool and moist; copious discharge from the head; occipital glands less swelled.

"This boy in a few days completely recovered."

The experiments of Dr SEEDS have also shewn, that the excessive detraction of blood gives rise to effusion of water within the head *.

The result of his experiments is, that the sinuses and veins of the brain of animals bled to death from veins, are commonly more turgid than when death has been occasioned by blood drawn from an artery; and he adds, "Si sanguis plurimus sive ex arteria, sive e vena affluxeret, *aqua intra caput effunditur.*"

An impediment to the free return of the venous blood is the most frequent cause of hydrocephalus, as also of other dropsies: hence hydrocephalus is frequently connected with tumours of the brain, (Vide Plate I. fig. 3.); or with an enlargement of the pituitary gland; with tumours of the neck; or with enlargement of the heart, and the occipital lymphatic glands, and diseases of the lungs; or with any cause which impedes the free return of venous blood, as by tumours passing upon the su-

* Vide his Thesis, 'De Sanguine misso,' Edinb. 1815.

perior longitudinal sinus, torculor Herophuli, or the jugular veins.

Hence we meet with the effusion of water within the ventricles of the brain of criminals who, when in perfect health, have been killed by suspension. It is remarkable how soon the effect follows the operation of this cause. I found about half an ounce of water at the basis and within the lateral ventricles of the brain of a criminal, whose body I examined immediately after execution; and in other criminals, after the lapse of a few hours.

Dr KELLIE of Leith, in his very ingenious paper upon death from cold, has observed, "The effusion which was discovered within the heads of our subjects, can hardly be regarded as a post-mortem production; nor can it be presumed that it existed previous to their exposure on that night which terminated their existence. The perfect parallelism of the two cases,—their agreement with another case by QUELMALZ,—their simultaneous exposure and death on the same night that another individual died under similar circumstances, render such a supposition highly improbable. If this serous effusion were not a post-mortem effect, and if it had no existence previous to the exposure of the individuals, then we must conclude that the whole, or the greater part, was effused in the short interval between their exposure and their death*."

The accumulation of a certain quantity of water within the ventricles of the brain, probably gives rise to a farther effusion. The branches of the veins distributed

* Vide Transactions of Medico-Chirurgical Society of Edinburgh, vol. i.

on the lining of the lateral ventricles, the vein of GALEN, and velum interpositum, are compressed. On the same principle, hydrothorax sometimes gives rise to anasarca; or hydrothorax is the prelude of hydrocephalus.

A suppression of the usual discharges is stated by authors to be one of the most frequent causes of dropsy, and the same observation may be extended to hydrocephalus. Dr GOLIS (a warm advocate for the opinion that hydrocephalus is connected with inflammation of the brain and its membranes) has justly stated, "When the urine is unnaturally scanty, the physician ought to be on the watch for an affection of the head."

Hydrocephalus, like other diseases, is very frequently connected with scrofula, and is undoubtedly most frequently found in scrofulous families; and those tubercles which are so frequently observed upon the membranes or surface of the brain of scrofulous persons, probably are of the same nature as those of the lungs and intestines, which do not originate from inflammation, in the opinion of BAYLE, LAENNEC, or ANDRAL *junior*.

If, in the families most frequently afflicted by hydrocephalus, we do not meet with ulcers decidedly of a scrofulous character within the brain, or in the other parts of the body; we may observe the same florid and clear complexion,—the same lively disposition, the same delicate, but relaxed, fibres, with the same quickness of apprehension, the same feeble action of the heart, and want of vital energy, so often noticed in scrofulous children.

The late Dr PERCEVAL of Manchester, an acute and

intelligent observer, has remarked, *that of twenty-two children who died of dropsy of the brain, eleven were manifestly scrofulous*, and three others, though not bearing the scars of scrofulous ulcers, were evidently of a scrofulous constitution.

It is also a common remark, that several members of the same scrofulous family are afflicted with hydrocephalus. Dr CHEYNE has also observed, "*it (hydrocephalus) chiefly falls upon the children of families having a strumous taint.*"

The appearances on dissection, in cases of hydrocephalus, scrofula, and dropsy, are similar.

When water has been accumulated within the ventricles of the brain, scrofulous tumours in the vicinity of the venous sinuses *, or in other parts of the brain, are occasionally found, scrofulous tubercles of the lungs or liver, and a scrofulous enlargement of the mesenteric glands. See cases above described, at page 49.

The analogy between hydrocephalus and dropsy, may be further traced from the effect of the remedies by which both diseases have been occasionally relieved or cured.

Hydrocephalus is occasionally removed by the same remedies as other kinds of dropsy, though, on account of the peculiar structure of the brain, and the effects of the disease in deranging its structure, the cure is more uncertain.

From what has been above stated respecting the origin, causes, and appearances on dissection, instead of regarding hydrocephalus as generally connected with inflammation, it is rather to be imputed to scrofula, or

* Vide Plate I. Fig. 3.

to those causes which occasion a derangement in the circulation of blood through the brain, through the bowels of the chest* and belly, than to inflammation of the brain, or what has been called Subinflammation by authors, and which acts peculiarly on a scrofulous habit.

Prognosis.

From what has been stated as to the causes from which hydrocephalus originates, it is evident that the prognostic is generally unfavourable, though by no means so invariably so as Dr WHYTT has pronounced it to be.

That distinguished author has observed: "I freely own that I have never been so lucky as to cure one patient who had those symptoms which with certainty denote this disease; and I suspect that they who imagine they have been more successful, have mistaken another distemper for this."

Dr FOTHERGILL entertained a similar opinion.

It is no doubt true that the prognosis is generally unfavourable, and it is so on several accounts.

1st, Because when water has been accumulated within the brain, the functions of that important organ are, by the pressure of the accumulated fluid, more or less deranged, and the pressure probably occasions a devia-

* When the heart is diseased, water is generally found within the ventricles of the brain. This connection between diseases of the heart, and the effusion of water within the head, has been much insisted upon, and happily illustrated, by Dr CRAIGIE. Vide Edinburgh Medical and Surgical Journal, vol. xix. p. 68.

tion from the healthy structure of those very important parts of the brain which are in the vicinity of the ventricles; to which is to be added the influence of water, when once accumulated, giving occasion to the rapid effusion of more fluid, from its compressure upon the veins proper to the membrane which lines the ventricles, the large vein of GALEN, and the velum interpositum.

2d, The disease often proves fatal, because it is often connected with an organic disorder of the brain, or of its investing membranes, or with organic disorders in the neck or bowels of the chest or belly, which in many cases cannot be removed.

3d, Because, if we adopt the opinion of some authors, that it arises from a congestion of blood in the veins, the observations and ingenious experiments of Dr KELLIE have shewn, that it is very difficult to remove such a congestion. The case detailed in pages 112. and 113. of this Essay, and the experiments of Dr SEEDS, shew that large bleeding is followed by effusion of fluid into the ventricles.

4th, Whether the softening of the brain be the prelude to the effusion, or the consequence of it, considering the disorganization of the brain thereby produced, it is difficult, probably impossible, to remove it.

Notwithstanding the above circumstances, there are a few instances in which hydrocephalus acutus has been cured.

I have met with instances in which all the more usual and characteristic symptoms of the effusion of water were present, which symptoms disappeared after the exhibition of proper remedies.

Drs PERCIVAL *, DOBSON †, and RUTHERFORD, concur in that opinion. There are also a few examples, in which the effusion of water has ceased; after the head had attained an extraordinary magnitude.

But, though the symptoms of hydrocephalus have been removed, the disease has, in some instances, returned, after the lapse of a year or two; and this may happen, if a tumour be the cause of the effusion within the ventricles, in the same manner as when hydrothorax has originated from a disease of the heart, the water has been occasionally removed from the chest, by the exhibition of remedies, which have as little controul over an organic disease of the heart, as over a tumour within the brain.

Dr CARMICHAEL SMYTH has published his sentiments as to the cure of hydrocephalus, in the following paragraphs:

"In respect to myself, I am ready to confess, that, having employed mercury on eight or ten different occasions, and though salivation had been sometimes excited, without one successful termination, my sentiments were much the same with the gentlemen above mentioned, until the fortunate issue of one case of hydrocephalus to which I was called, convinced me of the danger of forming hasty conclusions, as it carried the most complete conviction to my mind, that recovery from this formidable disease, however rare, was not impossible; and convinced me, that my previous unsuccessful endeavours, and those of others, were rather to be imputed to our not having seen, or from not having known

* Edin. Med. Comment. vol. vi.

† Ibid. p. 221.

the disease at an early period, than to any want of skill in the treatment, or of efficacy in the means employed.

"The mother of the patient, to whose case I allude, was a widow left with four children, two of whom she had already lost by this disease, which was ascertained after death by the examination of the bodies. That they had the best medical assistance will not be doubted, when I mention the names of Drs WARREN and TURTON, who attended them. The anxiety of a parent naturally led her to be extremely attentive to the symptoms of the disease, and from the loss of two children, she took alarm immediately upon the slightest appearance of indisposition; she, therefore, upon the youngest remaining child being attacked by the disease, sent immediately to an apothecary of considerable reputation in the neighbourhood, who attended the child for three or four days before I was called in: and so rapid had been its progress, that, even at this early period, the slow intermitting pulse, mentioned by Dr WHYTT as the characteristic symptom of the second stage, had already come on, which afforded me but small reason to expect that I should be more fortunate here than on former occasions. However, I determined to make some alteration in my mode of treatment, and as the child, though long ill, at last perfectly recovered, and has since been a mother herself, and as I imputed, whether justly or not, her recovery to the method of treatment which I adopted. I shall give some account of it; and to do so, I am still farther induced from having succeeded in another instance, where the child was under my own immediate care and direction; and in two others, where the same method was pursued, in consequence of my advice; besides two more that came under my care, where,

though the disease terminated fatally, an absorption of the fluid took place, as was apparent in the one from the symptoms, and was confirmed in the other by the examination of the brain after death."

I agree perfectly with Dr GOLIS in the sentiments expressed in the following paragraphs :

" The complications of hydrocephalus with febrile eruptions, as measles, scarlet fever, smallpox, or with worm or nervous fever, are, as long experience has taught me, always fatal; because the most acute and attentive physician is often not able to distinguish the hydrocephalic symptoms from those of the disease with which it is complicated; or if he should, and is called even at that moment of the disease, when otherwise a radical cure would be possible, the means necessary for the acute hydrocephalus would render the other disease fatal; for example, large doses of calomel, large detractions of blood, in its complications with worm or nervous fever. I have seen all these complications terminate fatally.

" Even when the treatment is conducted in the most perfect way, and attended by the most striking amendment, the physician is never sure of the recovery of his patient. I have often seen the distressing headach, the violent vomiting, the sensibility of the eyes, and the other symptoms vanish; the slow intermitting pulse become natural; the disturbed vital functions fall into order; the wish to eat and drink return; but scarcely have twenty-four or forty-eight hours passed, before all the worst symptoms recurred, and death ensued *."

* Vide GOLIS on Hydrocephalus, translated by Dr GOOCH.

Of the Terminations of the Acute Hydrocephalus.

As has been above stated, this form of hydrocephalus generally proves fatal, but occasionally it has terminated in epilepsy, hemiplegia, blindness, or in the disjunction of the component bones of the skull, as in the subjoined instance which occurred to me, December 3. 1804.

" The patient, a boy of eleven years of age, was suddenly seized with subacute headach, and acute pain in his neck, which lasted for some time. After the lapse of several hours, the headach and pain in the neck were more acute than before.

During the three or four preceding weeks, his parent observed that he had been unusually fretful, became pale, and lost his flesh. His headach was occasionally so acute as to deprive the boy of his senses, he clasped his hands upon his head, and *exclaimed he was certain his head was splitting.*

About four months ago, his mother observed a swelling of the head, as she called it, *after which the pain in the head entirely subsided.*

In the course of a few days the patient became blind.

During the following month, he suffered acute pain in his left leg, which was followed by the loss of the use of it. Soon afterwards he lost the use of the right leg. Upon attempting to use his left arm, he found he could not raise it to his head; it trembled excessively: he still retains the use of his right arm. He became much emaciated. His pulse about a week ago was about 110; it has risen up to 150 beats in a minute.

Until within a fortnight, he readily answered all ques-

tions proposed to him, and had a good appetite. He suffered much from thirst, and drank frequently.

Within these few days he has become comatose and insensible, sleeps almost constantly, and with his eyes fixed, open, and turned much up, and in different directions, and his pupils are much dilated. About three months ago, a considerable quantity of thin watery liquor ran from his nose for four days, which I was informed was so acrid as to erode his upper lip; but of late his nose has been quite dry. He has gradually lost the power of swallowing solid food, but takes wine, or any other liquid which is put into his mouth. From the small quantity of nourishment he takes, his evacuation by stool is of course very scanty, and occasionally he has had no passage in his bowels for some days.

He has been for some time occasionally seized with febrile paroxysms, during which his tongue is much furred, and of a darker colour than usual. His pulse rises between 30 and 40 beats in the minute. His face is flushed, and there is a copious perspiration over the upper part of his body.

He breathes with a considerable degree of oppression, and much quicker than common. The duration of these febrile attacks is very various; sometimes they last only for a few hours, at other times for twenty-four or twenty-eight hours. The back part of his head became ulcerated, from his constantly resting on it.

When four and a half years old, was seized with a typhus fever;—soon after he had measles, which were very severe, and since which, his mother thinks, he never regained his former good health; and soon thereafter began to complain occasionally of acute pain in his head. His head measures in circumference 23 inches; from the

most projecting part of the os occipitis to the root of the nose 18½ inches; across the head, from ear to ear, 15 inches. When measured by a pair of callipers, it was found to measure, from ear to ear, 6 inches; from the most projecting part of the os parietale of one side, to the most projecting part of the opposite os parietale, between 6¾ inches and 7 inches; and from the most prominent part of the os occipitis to the root of the nose 8 inches.

The shape of the head is essentially different from that of a child who has laboured under hydrocephalus from birth. The forehead is considerably protruded, yet not so prominent as when hydrocephalus has appeared at birth. The os frontis was found to be separated from the parietal bones to the distance of about an inch. Immediately behind the os frontis, the head becomes much broader, owing to the separation of the parietal bones from each other, and from the frontal bone, to the extent of about an inch. The os occipitis is also in a slight degree protruded, but much less so than the other bones, perhaps from the child resting constantly on the back part of his head.

The lambdoidal suture has given way only about half an inch, and the upper part of it much more than the under part; it became gradually narrower as it descends.

The patient lingered under the disorder during fifteen months from the date of the disunion of the bones of the skull.

Dissection.—Upon removing the skin of the head, the parietal bones were found to be separated from each other about half an inch. The os frontis was separated from the parietal to about the distance of an inch, and

the occipital was separated from the parietal bones about one-fourth of an inch.

The edges of all the bones of the cranium were soft, and to appearance in a state of growth.

The skull, at its back and fore parts, was of the common thickness; at the lateral parts much thinner than natural; the membranes of the brain were sound; and, as is common in children of the same age, the dura mater adhered more firmly to the inner table of the skull than in persons farther advanced in life. There was a slight adhesion between the tentorium cerebello-superextensum and the cerebellum, and also between the cerebellum and its dura mater.

The surface of the brain had its usual firmness; on pressing it, the undulation of a fluid within the ventricles was plainly perceived. There was only about an inch between the distended lateral ventricles and the surface of the brain.

Upon opening *the ventricles,* ℥ xiv *of clear water were found within them.*

The parietes of the lateral ventricles seemed *to be more dense and compact than natural,* and the vessels upon the pia mater lining them are very apparent, from being a little enlarged, and distended by florid red blood.

The thalami nervorum opticorum and corpora striata, were of the usual size, and figure, and appearance: nor were the optic nerves diminished in size after their exit from the thalami. The choroid plexuses were smaller, and of a less florid colour, than natural; there seemed to be an effusion of a watery fluid into their cellular substance, and there was also a small hydatid attached to the left choroid plexus. The corpus callosum was a little elongated; the septum called lucidum was quite

entire; and the communication between the lateral ventricles was so much enlarged, as readily to admit the point of the little finger.

The third ventricle was a little larger than usual. *The surface of the cerebellum was distinctly felt to be harder than natural;* but it was very pulpy within, and a cavity or bag, containing purulent matter, was found within it.

The fourth ventricle seemed a little dilated; the pituitary and pineal glands, and corpora quadrigemina, were particularly examined, and found in their natural state.

In short, the upper part of the brain was much enlarged; and the under seemed as if it had suffered a good deal from the effects of pressure."

Of the Treatment of Acute Hydrocephalus.

In a former chapter, the different opinions which have been entertained as to the cause of the effusion of the water were mentioned, and canvassed at considerable length, because, according to the opinion we shall form as to the cause of the disease, the method of preventing and of endeavouring to cure it, is regulated.

If the disease be supposed to originate in debility, in laxity of the brain and its vessels, it may possibly be averted,—by avoiding cold,—all vicissitudes of the weather,—and every means by which the bodily strength may be impaired,—and by endeavouring to improve and invigorate the constitution, by generous diet, wine, and the keeping the bowels regular,—and by removing irritation, and the irregular action of the chylo-poetic vis-

cera,—by warm clothing, and moderate and daily exercise in a pure atmosphere.

By adopting such a mode of treatment, I think I have had the satisfaction of averting the disease.

But, on the other hand, should the disease be supposed to proceed from the over-excitement of the vessels of the brain, and if inflammation be the primary cause, and the effusion merely the effect, an attempt should be made to remove that state by the general and topical detraction of blood, low diet, by refrigerant applications to the head, by purgatives, and by setons applied to the neck, by spices and blisters, and by avoiding all such causes as induce plethora.

In my description of the symptoms of the subacute hydrocephalus, I have endeavoured to point out to my reader, that a derangement of the functions of the alimentary canal gives rise to the earlier symptoms of hydrocephalus. The patient's stomach is disordered; the abdomen is often tense, and painful; the stools are like clay, of a variegated colour, and of a very offensive smell; hence the necessity of evacuating the contents of the intestines by calomel and other purgatives.

I have stated torpor of the intestines to be a consecutive symptom; and this merits peculiar notice, as indicating a derangement in the functions of the brain, in which case, a large blister should be applied over the head.

Calomel, combined with James's powder, is of great use in restoring the healthy functions of the bowels.

Fothergill, Rush, Cheyne, and Carmichael Smyth, have highly recommended the daily use of the more powerful cathartics, as gamboge, colocynth, scam-

mony, combined with calomel, and these must be given in large doses to procure an evacuation.

There is no class of remedies which affords greater relief in the hydrocephalus than purgatives, and especially calomel.

Purgatives have an excellent effect; they relieve the head and symptomatic fever. Large doses are required to procure an evacuation, on account of the torpid state of the bowels.

In general, children bear calomel better than adults. If calomel be given in an over dose, it produces colic and severe diarrhœa, and sometimes inflammation of the intestines. A grain may be given every third hour to a child of a year old, and the dose is to be repeated until a free evacuation has been produced. But should the child have acute pain in the belly, the medicine must be given up, for if more be given, an inflammation of the intestines will probably follow. I have given three grains of calomel, three or four times a-day, to children of ten or twelve years of age, afflicted by this disorder; and it did no more than keep the bowels open, or, at most, produced only three or four stools.

By the application of a large blister, composed of tartar-emetic and wax-ointment, to the head, and the use of calomel combined with James's powders, I have cured the disease. It may not be improper to mention the case of a boy, who was my patient at the Dispensary, who had all the symptoms of hydrocephalus, and was supposed dying by two surgeons, and a physician, who were so fully persuaded as to the unfavourable issue of the case, that they requested of me to inform them when the dissection would take place, as they wished to see the state of the brain. The boy

recovered, and to my knowledge remained well three years afterwards.

Two other children, with all the symptoms of hydrocephalus, were treated in a similar way, and with equally good success. Both died two years afterwards from hooping cough. Mr WHITE, surgeon, aware of the nature of the previous disease, and of the mode of treatment which had been adopted, examined with great care the heads of both these children, and assured me there was not a single drop of water within the ventricles of the brain.

My late colleague Dr RUTHERFORD told me, that he had adopted the same plan of treatment which I had pursued, and with success, in several instances.

I was induced to make trial of James's powder on the authority of Dr CHEYNE, and, after repeated trials, I think it a valuable remedy. Dr CHEYNE's evidence in its favour is very strong. He states, "A respectable clergyman, who resides a few miles from Dublin, had been so unfortunate as to lose three or four of his children of water in the brain. He observed that the physicians endeavoured to bring on a perspiration, but always without effect; and he determined, should the complaint seize any of his other children, to take the management of the case into his own hands. The opportunity was soon afforded by the illness of one of his daughters, and the remedy he used was James's powder. This medicine had a great effect upon the child, who, though she had all the symptoms which attended the attack of the disease in the fatal cases, recovered. He gave the child a large dose of James's powder at bed-time; this was repeated every night, and, on alternate nights, as much rhubarb was added as was sufficient to move her bowels. This remedy, it is alleged, has been successful

in a number of cases of hydrocephalus which have occurred since." Dr CHEYNE, however, says, "In several cases of hydrocephalus, I have known James's powder given both as this gentleman recommended, and also in much larger quantities, and in a quicker succession of doses, without relief. But making every allowance for the misconceptions of the ignorant, James's powder has been a valuable auxiliary."

If there be pain and tenderness in the region of the liver, the patient will derive much benefit from the application of leeches to the region of the abdomen.

Some physicians have recommended a succession of blisters. I prefer applying one large blister, as being more efficacious, and the blister to be kept open.

If such a blister be composed of cantharides, it is very apt to induce strangury; hence one made of tartar-emetic and wax-ointment should be substituted. Dr CARMICHAEL SMYTH has highly recommended the application of the nitrate of silver in powder, put on adhesive plaster, spread on strong leather, and of the size of an elongated half-crown, and to be placed on the bregma. He considers the caustic more certain in its effect, and more powerful in its operation; and the drain or issue should be applied for some time.

Mercury has been much recommended as a remedy in this disorder.

Dr DOBSON of Liverpool had the merit of introducing this medicine as a remedy for hydrocephalus, and he has published an account of a cure of the disease in the 6th volume of the London Medical Observations. He has adduced the strongest evidence in favour of mercury. He has stated, that four members of the same family were in succession attacked by this disorder.

and that three of these died. Mercury was prescribed to the fourth, and given in the form of calomel and mercurial inunction. In forty-eight hours ptyalism was excited, the symptoms gradually abated, and the child obtained a complete recovery.

Since Dr DOBSON's publication, mercury has been much employed as a cure for hydrocephalus by many practitioners.

Dr PERCIVAL has made particular mention of the case of his own child, to whom he gave mercury. He has observed: "In forty-eight hours there were obvious symptoms of amendment; and in six days the child completely recovered, during which period 13 grains of calomel had been administered, and ʒvii. of the strongest mercurial ointment had been rubbed in on the limbs."

The same remedy was employed by Dr CARMICHAEL SMYTH in the following way. He directed 10 grains of crude mercury to be rubbed down with 20 or 30 grains of cordial confection, to which 5 grains of the fresh squill were added, and the above made up with a syrup to the consistence of a soft bolus, and to be divided into such parts as was necessary for its being administered along with a little gruel. This dose was given every five or six hours, when the child's stomach could bear it; and with this mixture, with the aid of the application of caustic to the bregma, he was so fortunate as to remove the disease.

Several cures of hydrocephalus by mercury are recorded in the Medical Journals. Vide Med. Com. vol. vii. p. 290. Ibid. vol. viii. p. 325. Mem. Med. Soc. vol. vi. p. 50.

Doctors RUSH and COINDET do not place much reliance on mercury. Dr CHEYNE, on the other hand, observes, that he had witnessed its efficacy in several

cases. Dr YEATS recommends the diligent use of mercury externally and internally, which, he observes, "powerfully assists, with the other means, in altering that morbid excitement constituting the disease."

But mercury does not prove a certain cure for the disorder, excepting when given at the commencement of the disease.

My Father has published the following observations on the use of different remedies in the cure of hydrocephalus *.

After mentioning twenty-two cases of this disorder, in which he had unsuccessfully employed mercury, he states:

"As in the greater number of the above cases, the disease had made considerable progress before I was called; and, as most of the patients survived but for a short time thereafter, the effects which the mercury may have, if given on the first appearance of the symptoms, are by no means fully determined. And, as I have repeatedly found, in other dangerous species of the natural encysted dropsy, particularly in hydrothorax and ascites, that mercury combined with squills or other diuretic medicines, in such quantity as to salivate in a slight degree, contributed much to the relief or cure of the patient, I would recommend the further trial of it in hydrocephalus. At the same time, considering the importance, sensibility, and delicate texture of the parts which are affected, and total failure in the cases I have described, I cannot help suspecting that several late writers are much too sanguine in their expectation of removing hydrocephalus by the use of mercury."

* Treatise on the Brain, p. 64.

It appears from the subsequent case, which occurred to my Father, that the water has been sometimes absorbed. The patient laboured under all the usual symptoms of hydrocephalus, excepting the slow pulse. The pupils were so much dilated that the irides scarcely were seen. In the course of the disease the child became comatose. A waxen kernel broke in the neck, after which the patient recovered, and continued well for a year. The following year the child died, and, upon opening the brain, four ounces of water were found within the ventricles of that organ.

Much attention should be paid to the diet of the patient.

Children afflicted by this disorder are very unwilling to take the necessary nourishment; they have little or no appetite, and many seem to have a constant nausea, and besides, are unwilling to be disturbed, to rise in bed, or to be exposed to the light.

The diet of the patient should be easy of digestion, and at the same time nutritious, consisting chiefly of animal or vegetable jellies, weak broths, or white wine-whey, and given in small quantity and repeatedly, as the stomach at the beginning of the disease is in a very irritable state, and a very slight cause, especially distention, is apt to excite vomiting.

Nutritive clysters should be frequently administered, for they serve as nourishment and as laxatives. It is necessary from time to time to change the kind of food, and, in the progress of the disease, to give more wine than at first.

SECTION II.

OF HYDROCEPHALUS ACCOMPANIED BY AN ENLARGEMENT OF THE SKULL.

In a preceding chapter, pages 33 and 34, I have described at some length the state of the skull, and also that of the brain, when these have been expanded by an accumulation of water within the brain *.

When the ventricles of the brain are distended, the convolutions disappear to a greater or less degree, and become shallower, and their vertical fibres become horizontal; and I have endeavoured to prove that there is not only a mere extension of the brain, but also an absorption of a part of its substance.

It yet remains for me to make a few remarks upon the appearance of the patient while alive, and upon the symptoms.

* Professor Burns has described a disease resembling Chronic Hydrocephalus. "The patient complains of his head and neck for a length of time; has the pulse increased by exercise, agitation, or reading long, and sometimes he squints. The pain is, however, rheumatic; follows the course of that disease, is not constant, and shifts its place. The squinting is either habitual, consequently accidental with regard to the disease; or is caused by a temporary affection of the muscles of the eye, and is increased by looking long at any object. On opening the head, we generally find a great quantity of water in the ventricles, and some even on the surface of the brain. Sometimes the ventricles are so much enlarged, that the cerebrum resembles two vesicles lying on the cerebellum. The bones of the cranium are occasionally very thin, and softened; sometimes very irregular on their inner surface."

The child looks unhealthy, applies his hands often to the head, is drowsy, and sometimes convulsed.

In the course of my practice I have seen fourteen examples of the disease, and the victims of it were of different ages.

All of them were born with large heads, and, at the period of birth, the head had evidently undergone considerable pressure in passing through the pelvis of the mother, and the skin of it was of a deep purple colour.

One of the patients died in a very short time, after a few convulsive respirations; others dragged on a miserable existence for several years, and one of my patients reached the age of twenty-seven. Generally speaking, the size of the head was in proportion to the age of the individual, though it did not expand gradually and uniformly during the progress of the disorder, but grew much more rapidly at one time than at another.

But, according to some authors, the disease appears soon after birth, or even a few years after it. The child seems dull. This dulness is accompanied with headach and fever, which is much more severe at times, and is attended by sickness and vomiting. The appetite is impaired, and the food is apt to excite nausea. The headach becomes more severe and constant, and is accompanied by pain and stiffness in the neck, and with frequent and irregular pulse; but, in some cases, is slower than natural. The eye is dull, and the vision is indistinct; the skin is hot, and the pulse frequent and irregular. The urine is discharged with pain and difficulty. After the above symptoms, the head expands.

The heads of the victims of this disorder are, to the eye, monstrous as to size and form, owing to the great disproportion between the upper and under parts of the

head; the upper or cranial part being much expanded, whilst the under or facial part retains its usual size.

The appearance of the countenance is peculiar, the eye-brows being much drawn upwards, and the eyes being staring and prominent, from being forced, to a certain degree, out of their sockets, by the depression of the orbitar processes of the frontal bone; and, in some cases, from the distention of the skin, the patient cannot shut the eye-lids, and the expression of the countenance betrays a want of intellect.

The body is always shorter than natural, which often proceeds from the distortion of the spine; and all the bones of the body, with the exception of those of the head, are not only shorter, but also thinner, than those of individuals of the same age, who have enjoyed good health.

It is not easy exactly to measure the height of these patients, as they are incapable of standing erect, owing to the great weight of the head and weakness of the limbs. They generally lie in bed with the body and legs much bent and contracted, and lose the power of straightening themselves, and some of them have entirely lost the power of their legs, and retain only a slight power over their arms. After a few months, the symptoms of oppressed brain are distinct.

Some of my patients were remarkably irritable, and started upon the slightest noise, but this morbid irritability sometimes goes off to a certain degree in the progress of the disease. Some have convulsive fits. Most patients afflicted by this disorder do not sleep soundly; they may be said to dose rather than sleep, not only during the night, but also during the day. They remain very quiet in bed, and are not annoyed by fearful

or distressing dreams, like those who are threatened with apoplexy, or who have had paralytic strokes, nor do they seem agitated upon coming out of their sleep. Most of my patients moved the head constantly like many paralytic persons, and rolled their eye-balls, and could not fix the eyes upon an object. It is very remarkable, that the majority of my patients did not suffer from headach; one of them, however, suffered severely from that cause, and cried constantly. Several of my patients had convulsive fits occasionally. The digestion of some was good, but in others it was more or less impaired; they had occasional nausea and vomiting; and towards the conclusion of the disorder, they had little or no appetite, and hence became much emaciated.

Most patients afflicted by this disorder lose their sight: their pupils are much enlarged and immoveable when light is applied: the eyes are watering and covered by mucus, and rolled from side to side. In some patients, the iris and whole of the cornea is concealed behind the upper eye-lid. The body wastes, and the patient loses the power over his muscles, or the limbs are convulsed.

Though the sight be impaired, the sense of hearing is remarkably acute, so that the patient is roused from his dosing by the slightest noise.

The senses of smell and taste are as little impaired as that of hearing.

The greater number of my patients could not utter an articulate sound: others spoke very indistinctly, the muscles of the tongue being incapable of that nice adaptation and co-operation, which is necessary to distinct articulation. The pulse is generally not quicker than in health, and sometimes slower.

The phenomena which have been observed as to the state of the brain of those afflicted by this disease, afford to the physiologist an ample subject for speculation. It is almost incredible how little the powers of the mind are impaired by this disorder, considering the great enlargement of the ventricles of the brain. I have had opportunity of seeing several examples of this form of hydrocephalus, and have watched the progress of the symptoms for years; yet I have never met with any one instance in which the powers of the mind could be said to be completely deranged. On the contrary, in one of the most remarkable instances I have met with, in which the disease was of twenty-six years' duration, and in which the head measured 44 inches in circumference, the patient displayed a very affectionate disposition towards his parents, expressed much anxiety for the return of his father, a fisherman, when he went to fish, and entered, as far as his unfortunate situation would permit, into all the amusements of his brothers and sisters; though born with hydrocephalus, he was docile, and had such a retentive memory, as rendered him capable of committing to memory several portions of the Psalms, which he recited with accuracy.

Dr SPURZHEIM has described several instances in which the mental powers were not impaired, though the head was much enlarged, and in particular that of a learned man, "whose head is extraordinarily high on the anterior superior part of the forehead, and which, according to its size, must contain from three to four pounds of water, yet this man has extensive knowledge. The only inconvenience which results from his peculiar state is, that he often falls suddenly asleep in the midst of the most interesting conversation, at table, at the theatre, and elsewhere."

I shall never forget the impression which the sight of the last patient I have seen made upon my mind.

She was a girl of nine years of age, and I was told by her parents that she had been born with the disease.

She had rather a pleasing expression of countenance, had large brown eyes, saw well, and smiled when I entered the room.

She was sitting in an arm-chair by the fire-side, surrounded by her brothers and sisters, and was engaged in dressing a doll.

She answered my questions distinctly, said she suffered very little; she could keep her head erect, and I found upon examination, that the ossification of it was perfect.

In her mother's opinion, her mental powers were superior to those of her elder brothers and sisters.

Though her limbs were not in the smallest degree shrunk, she could not walk.

In this girl, the only symptoms characteristic of the disease independently of the large size of the head were, a slight shaking of the head, and her being incapable of fixing her eyes upon an object steadily for some time: She did not sleep well, and, as happens to most children in her unfortunate situation, she heard very acutely, and was roused from her sleep by the slightest noise, and often started during her sleep.

But the mental powers have in some instances been impaired, and in others deranged, by an accumulation of water within the brain. Sir E. HOME's cases illustrate both of these positions: "In the one, the accumulation of water proceeded, as it will appear, as far as it could go, without materially impairing the organ; it then stopped, and the boy grew up, with all his faculties, although

much weakened. In the other, the water continued to increase, and the faculties of the brain were destroyed."

The following is an extract from the first case: "He slept with more ease on the right side, and the left side of the head appeared to the eye to be rather the largest. In lying down, he felt what he described to be a momentary thrilling heat on the upper part of the brain, in the line of the longitudinal sinus. Lying upon his back strained his eyes so much, that he could not remain in that posture; stooping forward became oppressive to his eyes. The least weight in his hand, as a teacup, made it tremble; all sudden noises jarred his head, and produced giddiness. When he fell down, the jar rendered him insensible: at one time this was the case for fifteen minutes, without leaving any permanent indisposition. His head ached when exposed to heat.

"His memory of common things was very good. He never expressed any attachment or passion for women. He was of a mild disposition; but when irritated, his whole frame was in a state of agitation, which, however, soon went off. The brain performed all its functions, but not with vigour, nor for any length of time.

"I saw him again at St Thomas's Hospital, 4th May 1822. He was then twenty-seven years old, and did not remember me. He now had been able to lie with most ease for years. The two sides of his head appeared to be the same; the thrill, on lying down, was now under the left parietal bone; lying on the back, stretched his eyes; they had become stronger; his memory was much impaired; could not repeat verses, only part of the Lord's prayer, which he said every night;—fond of liquor, said it put him in spirits, and he liked to treat his friends; it went off rapidly by urine;—loved to kiss a

girl under the misletoe; penis full grown, one testicle very small; had erections, and dreams of women, but no emission; cheerful and mild; had tantrums, which lasted half an hour; the only fits he had since being in the Hospital were on the 1st of May, in which he was insensible ten minutes, one in the morning, one at noon, and one at night."

In another boy, an enlargement of the head was perceived at three months old, which increased for three years; it then appeared stationary, and the child was sensible. The upper part of the skull at that time began to ossify, and, in three years more, the ossification was so far advanced, that there was only an irregular space at the fontinelle, and a small space between the two portions of the os frontis. The child who had continued sensible for three years, became gradually less so; did not know what he did; heard sounds, but could not see. At six, died *.

Doctors GALL and SPURZHEIM have endeavoured to account for the integrity of the mental powers of the greater number of hydrocephalic patients with large heads, upon the idea, that the brain, in that disorder, is not wasted, but merely expanded. Such an opinion presupposes that we are acquainted with the immediate seats of the mental faculties; but, in the words of the committee of the French Institute, "The phenomena of hydrocephalic patients who have preserved their intellectual faculties for a long time, proved nothing; for as we do not know with what part of the brain, nor with what circumstances of its organization, these faculties are connected, we can draw no conclusion from it relative to the essential structure of the brain."

* Vide Lectures on Comparative Anatomy, vol. iii. pp. 73, 74.

Palsy, to a greater or less degree, is the usual concomitant of this variety of hydrocephalus.

It assumes different forms.

Some have a constant tremulous motion of the head, of the arms or legs, and, in the progress of the disorder, the sphincters of the bladder and rectum become paralytic. On some occasions, the patient becomes incapable of turning himself in bed; and when the head has attained a great size, the patient cannot, without aid, turn it from side to side.

Some children, with hydrocephalus, do not get their teeth at the usual period.

Some who have arrived at manhood have no beard; others have strong and masculine features, a strong beard, and the venereal appetite.

Patients afflicted by this disorder are occasionally, during damp weather, attacked by febrile exacerbations; during which, the skin is hotter than natural, the eyes somewhat suffused with blood, the pulse is quicker than natural, being 120 in the minute, and the tongue is white and clammy. This febrile state is of a day's duration, and is probably to be imputed to an increase as to the quantity of water within the brain, which, perhaps, may be connected with the suppression of the perspiration by the skin *.

Of the means of Relief.

Much may be done to relieve the patient. I have always remarked, that, when the body was constipated,

* Vide the cases of Hydrocephalus chronicus, which I published in Dr DUNCAN's Annals of Medicine for 1803.

the patient's sufferings were much augmented: hence the necessity of keeping the bowels freely open.

In the more advanced stages of the disease, when the sphincter muscles of the anus and neck of the bladder become paralytic, and when the fæces and urine are discharged involuntarily in bed, great attention to cleanliness is requisite, to prevent excoriation taking place.

Various means have been proposed for diminishing the volume of the head; and these, even in desperate circumstances, have proved successful, as happened in the following case, which Dr TRAIL was so kind as to communicate to me:—

"I had one interesting case of enormous hydrocephalus in a child about eighteen months old. The sutures were much distended; strabismus was present; the child was incapable of moving its head or body; the limbs twitched. It was under the care of Mr Reay and myself. We agreed to rub the mercurial liniment on the head daily, and to purge the bowels briskly with calomel, conjoined with other cathartics. This was persevered in for a month. The disease appeared stationary as regarded the distention of the head, the little power of the limbs, and almost comatose state of the patient; but the twitching and strabismus disappeared, and the bowels became more natural. Another practitioner recommended *pressure by a bandage to the head*, but it was not applied at all. The fontinelles began to close, the child slowly recovered, and, about ten months after, the mother brought the child to my house, when, to my surprise, the boy ran up to me in perfect health, and was an intelligent and engaging child, in whom no marks of disease remained, except that his head appeared larger than usual."

The late Mr WILSON *, teacher of anatomy in London, has mentioned the effect of friction with mercurial ointment, in diminishing the volume of the skull. He says, "I may be permitted to observe, that, when the cause is removed, the bones will cease to enlarge; and, in some instances, when the increase has not been carried too far, will recover their natural structure. I think it right to add, that, in one family, where two children had died of water in the ventricles of the brain, four others were in succession attacked with the strongest marked symptoms of the disease, attended with much enlargement of the head, who, by attention to the state of the gums, and mercurial frictions to the head and back, are now alive, well, and with as much mental intelligence as other children of the same years."

Blisters applied to the head are useful.

Garlic ointment has been stated to have tended much to remove the disease.

RIVERIUS † has made mention of a case of a boy afflicted by hydrocephalus, which was cured by the application of bandages to the head. The bandage operates by supporting the relaxed vessels, and stimulating the absorbent vessels of the brain.

Sir GILBERT BLANE observes, "that mechanical compression of the head might be of use in the cure of hydrocephalus, on the principles above mentioned, after the febrile symptoms had abated." Accordingly, he directed the head of a child, thirteen months old, to be "swathed with a roller as tight as possible, short of producing pain. Leeches were also applied, and a purgative given every two days." It is added, "an immediate amendment took

* Vide Lectures on the Structure and Physiology of the parts composing the Skeleton, and Diseases of the Bones, p. 260.

† Obs. Commun. vi.

place, so that all the complaint was removed in less than three months *."

Pressure was also tried by Mr HOOD, surgeon at Ayton, Berwickshire, but without success. The pressure brought on fits, and was therefore given up.

Considering that the symptoms of oppressed brain are relieved by the disunion of the bones, I should suppose that the pressure of a bandage put around the head, would generally produce the same effects as Mr HOOD has described; and hence it is only of use after the water has been artificially drawn off, in preventing the deliquium which will generally succeed the puncture.

During the progress of the disease, the patient's strength should be supported by soups, broths, sago; and, where there is great debility, wine is to be given.

As all the remedies are too often of no avail, it has been recommended by SEVERINUS and LE CAT to draw off the water by puncturing the brain.

My Father, in his lectures, used to employ many arguments against the puncture in cases of hydrocephalus, except when water is accumulated between the membranes of the brain, from a conviction of the fatal consequences of the operation. Independently of these bad consequences, puncturing the brain generally excites vomiting, syncope, or convulsions.

E. FERDINANDUS, FABRICIUS, D. PANAROLUS, WEPFER, MURALTUS, LE CAT, MORGAGNI, and HILDANUS, have confirmed the above statements; and it has fallen to my lot to add one fatal case to the catalogue †.

* Vide his Lectures on the Structure and Physiology of the Bones, p. 269.

† Vide page 11. of this volume.

Several instances are recorded in which the water has been several times drawn off from the brain, by means of a puncture made by a small needle.

But the disease has invariably returned, and proved fatal, except perhaps in the case published by Rossi of Turin *, whose remarks upon his operation are as follow:—"Je manquerois mon but, si je ne vous rapportois ici un exemple peut-être frappant, c'est celui d'une Hydrocephale interne, causée par une chute, où la tete avoit augmenté du tiers de son volume ordinaire; l'age du malade etoit de onze à douze ans; les symptomes de l'Hydrocephale se manifesterent trois mois après; l'articulation des os parietaux s'etoit ecarté de maniere à laisser sentir la fluctuation; j'y fis une ouverture avec la lancette, et je tirai par là environ six livres d'eau, à reprises dans l'espace de vingt jours le malade fut sauvé."

Had we been informed as to the sequel of the above case, it seems to me not improbable that it would be found as unfortunate as the case published † by Dr Vose of Liverpool, which he supposed to have been cured by puncture. Dr Traill has informed me, that "Dr Vose's case, after being several times operated on, proved fatal. When the bones began to unite more firmly, the symptoms of pressure became more and more urgent, and the parents became unwilling to allow any further attempt to relieve them. Each evacuation was followed by marked relief; and, as was remarked to me by one of the gentlemen present at the operation, immediately after the evacuation, the looseness of the integuments, and the free motion of the bones of the cranium, made the top of the head feel like a bag of bones."

* Chir. Operat. vol. ii.

† Medico-Chirurgical Trans. vol. ix. part 2.

"Several other cases," Dr TRAILL adds, "have been operated on at Liverpool; but in no instance does it seem to have cured the patient, although the operation certainly gave temporary relief."

SECTION III.

OF THE ENLARGEMENT OF THE BRAIN IN CONSEQUENCE OF THE EFFUSION OF WATER WITHIN THE VENTRICLES OF THE BRAIN, BUT WITHOUT THE CONVOLUTIONS OF THE BRAIN BEING AFFECTED.

THE enlargement of the brain from an effusion of water within the ventricles, and without an affection of the convolutions, is a very rare case.

We are indebted to the distinguished REIL for the first account of this disorder *. He has informed us that all the convolutions were solid, and not split up.

SECTION IV.

OF THE ENLARGEMENT OF THE BRAIN, WITH LITTLE, IF ANY FLUID WITHIN THE VENTRICLES OF THAT ORGAN.

THIS disease bears some resemblance to that kind of hydrocephalus which is accompanied by an enlargement of the head, although there exists very little or no serum within the ventricles of the brain.

* Vide Archiv. 1812, p. 35.

The patient is much inclined to fall asleep, suffers no inconvenience, excepting from the weight of the head, so that when he walks or runs, he is very apt to fall forwards.

At the outset of the disorder, the intellectual faculties are but little impaired. In the progress of the disease, the appetite begins to fail, the pulse becomes full and hard, which is accompanied by heaviness of head, and a disposition to sleep: pupil much dilated.

SCOUTETTEN has described a case of this description. The head was as large as that of a full grown man. The brain was firm, much enlarged, and *denser than usual.* There was but a small quantity of a reddish serum within the ventricles of the brain.

Dr DUNCAN junior was so kind as to communicate to me a similar case.

" The patient, eight months old, has a mishapen head, with evident gaping of the sutures; the sagittal suture is found open to the middle of the frontal bones. The longitudinal diameter of the head is $6\frac{5}{10}$ inches; the transverse $4\frac{75}{100}$ inches; its horizontal circumference 18 inches. Sits with her head erect, and is rather a lively child, but her body *is emaciated and flabby,* and her skin loose. In the evening she occasionally suffers acute headach, when she screams suddenly, and puts her hands to her head. Pulse 120; tongue moist and white; takes the breast freely, and seems to have much thirst; bowels costive; evacuations vary in colour, sometimes dark, sometimes light-coloured, but almost always very slimy.

" Was healthy during the three first months of her life, and nothing unusual was observed in the form of

her head. About four months ago was affected with an eruptive affection, which was succeeded by abscesses in each groin, and has left the lymphatic glands enlarged and indurated with carunculi on the labia pudendi.

" She was put upon a course of calomel and jalap, under which her stools became natural, and she gradually got better, but after some time she was attacked with febrile symptoms, and could not lift her head. This seemed to have become larger, and the occiput in particular more prominent. Skin hot; green watery stools. A blister was applied to the head, which was dressed with Ung. Sabinæ. Her pupils were dilated, but still sensible to light. She seemed to suffer acute pain, was evidently moribund, having frequent fits of convulsions, with great lividity of the skin, and she died in the evening.

" I had no doubt that there was a considerable quantity of water within the brain, and my astonishment was great to find, *that it contained no more than the usual quantity, and that the brain was in every respect natural, except a little increased vascularity on the surface.* I regret that the head was not measured after death, as it appeared to me to have increased in size, and that the brain was not weighed, and its weight compared with that of the body.

" In MECKEL'S Manual of Pathological Anatomy, vol. i. p. 298, published at Leipsic in 1812, a similar case is recorded. He says Mr NOLDE found, in a child of one year of age, who had exhibited all the symptoms of hydrocephalus, no water within the skull, but the mass of the brain, which, in its structure, was perfectly healthy, so enlarged, that the cranium was greatly

distended, and the ventricles almost entirely obliterated."

SECTION V.

OF HYDROCEPHALUS COMBINED WITH MALCONFORMATION OF THE SKULL, BRAIN, OR SPINE.

It would lead me into a very long digression to describe the various malconformations of the skull, brain, or spine*.

I have already alluded to the imperfections in the form of the skull, and shall only add a single case with which I was favoured, some years ago, by my colleague Dr Christison.

"P. M. aged seven months. There is a tumour about the size of a man's fist upon the face, extending from the supercilia to the tip of the nose, and transversely from the outer extremity of one cheek bone to the other. It is soft, but elastic, translucent, and covered on the surface with numerous bloodvessels. The distance between the supercilia and the tip of the nose seems to be considerably elongated; the ossa nasi are raised from their customary situation, and stand out nearly at a right angle with the lower part of the frontal bone. The tip of the nose is flattened against the upper maxilla; but the nostrils are perfectly pervious, and he can easily breathe through them alone. Compression of the tu-

* Some important dissections of this description have been made by MM. Beclard and Breschet of Paris.

mour does not diminish its size; neither does it induce any symptoms of compression of the brain. The eyelids and eye-brows are raised considerably above their proper place, and the internal canthus points upwards. In consequence, the eyes can be but slightly seen; but his vision is apparently quite perfect. The anterior fontenelle is nearly filled up, and admits no more than the point of the little finger. His general health is very good, he sucks freely, is natural with regard to all his functions, and he is remarkably tall and stout of his age. The tumour, according to his mother's account, is congenital. At the period of birth, it was about the size of a pea, and was situated at the lower margin of the ossa nasi, which it raised slightly from their proper situation. When he was ten days old, an attempt was made to reduce it by compression; but as this produced no diminution, and even seemed to bring on tumefaction of the eyelids, it was soon abandoned. About two months after birth the mother once succeeded in removing the whole tumour by compression, although it was then of the size of a hen's egg. She reports that at the time he was in the act of sucking; yet the repulsion of the tumour produced no sensible effect upon him, and he continued to suck as vigorously as before. For the last two months the tumour has not gained any additional size. No attempt lately made to compress it, has in the least degree diminished its magnitude.

"23d.—To-day a puncture was made at the lower part of the tumour, by Mr NEWBIGGING, near the nose, by means of a cataract extraction-knife, and about fourteen ounces of a transparent fluid were withdrawn. The ossa nasi still project at right angles with the os frontis.

" 24th.—He vomited a good deal soon after the operation. He then slept for six hours, but since then has been restless. Pulse 132; skin hot. Tumour has filled again, and is nearly as large as before the puncture was made. Bowels rather slow.

" Hab. statim Ol. Ricini 3j. et, si sit opus, post horas quatuor repetatur.

" 30th.—The tumour was again punctured yesterday, and twelve ounces of fluid were withdrawn. Became restless and uneasy in the evening. Vomited at one o'clock this morning, and repeatedly again till seven. It was intended to attempt the application of pressure after its evacuation, but the bandage was removed about midnight, in consequence of his breathing being much impeded. The tumour is again nearly as large as before it was punctured. Pulse frequent. Two stools by some castor-oil given last night. Very little urine passed since the operation. Asleep at present. The chalk has not been applied for three days past.

" Omitt. Creta cum Camphora.

" Oct. 2.—Has been disposed to be quiet, and often is seemingly asleep; though at times he is restless and uneasy. Pulse 130; bowels regular; urine increased since last report. The tumour has diminished in size; yesterday some discharge took place from it of a watery fluid, which has ceased to-day.

" 3d.—This morning at three o'clock the contents of the tumour were discharged by a spontaneous opening. The opening is of considerable size, and serum continues to pass by it. Two natural stools. Sucks freely. Vomited about half an hour ago.

" Simple dressing to be applied to the tumour.

"7th.—No return of vomiting since the 3d instant; but his feverish symptoms have continued gradually to increase. Has not sucked since yesterday morning; at times he is quiet; but at other times he is very restless, tosses his arms, picks his nose, and grinds his teeth; pulse about 130, and irregular. Considerable inflammation and thickening of the bag of the tumour, with pretty extensive ulceration. Serous discharge still continues.

"℞. Sacchari gr. x, et Submur. Hydrarg. gr. vj. Misce. Divide in doses xij, quarum sumat j. mane et vespere. Arrow-root with milk.

"8th.—Has not sucked; but he has taken some of the arrow-root. Upon the whole, he lies pretty quiet, but is frequently troubled with starting. The head is kept constantly drawn backwards. The discharge from the tumour is principally purulent. Bowels easy. Urine voided freely.

"Continue medicine.

"10th.—Died this morning about 6 o'clock, his death having been preceded for two hours by convulsions.

"*Dissection*, thirty-one hours after death. On removing the integuments, the anterior fontenelle was found almost completely filled up, the parietal and frontal bones being only slightly moveable upon each other, at the common point of union. The dura mater, which adhered very firmly to the skull, was in itself quite healthy to appearance; but on the right side, and at its anterior part, it evidently covered a quantity of fluid, which indeed oozed out by an aperture made in it accidentally. On slitting up the dura mater, a quantity of fluid, amounting to about six ounces, was accordingly found in the situation described; and betwixt it and the

dura mater there was interposed an adventitious membrane, thin, transparent, but firm.

"The dura mater and this membrane being removed, the following appearances presented themselves. 1. Uncommon vivid redness and vascularity of the whole pia mater. 2. A copious effusion of coagulable lymph betwixt the arachnoid and pia mater of the left hemisphere, close to the falx, and extending from the anterior extremity of the anterior lobe, backwards to about the middle of the brain. 3. A slighter effusion, of the same nature, on the corresponding part of the right hemisphere. 4. Compression of the right hemisphere, where the fluid had been collected. 5. Numerous specks of effused lymph on the surface of this compressed part. 6. A line of lymph, with thickening of the pia mater, extending from the anterior extremity of the right hemisphere to within two inches of its most posterior part, being the line of attachment of the adventitious membrane to the arachnoid.

"A small puncture being made into the posterior part of the left ventricle, a large quantity of slightly turbid fluid was immediately discharged. The puncture having been made accidentally by a bystander, the precise quantity could not be ascertained; but four ounces were collected, and there were lost at least two ounces more. The opening was then continued forward to the anterior part of the ventricle, which presented the following appearances. 1. Great enlargement of the ventricle, and, in particular, an unusual prolongation forwards by a very narrow cavity, which seemed, at first view, to lead externally to the cribriform plate of the ethmoid bone, but suddenly stopped when at the distance of a quarter of an inch from the external surface of the brain. 2. Great vascularity of the lining membrane of the ven-

tricle. 3. A considerable quantity of coagulable lymph floating in the serum that remained in the posterior and inferior cornua.

" A similar opening was then made into the back part of the left ventricle, and about an ounce and a half of fluid discharged. The opening being continued forward, the ventricle was found enlarged, but not prolonged forward as the other was; its walls, betwixt the posterior cornu and the corpus striatum, were disorganized, and reduced to a thin pulp, of a mixed grey and white colour; and the same vascularity existed as in the left side. The septum lucidum was much extended from above downwards; its anterior extremity was pushed to the right side; and the foramen Monroianum hardly more open than it is naturally.

" On laying open the sac of the external tumour, which was now small, hard, and thickened, an opening, fully three-fourths of an inch in diameter, was found in the ethmoidal cells; the dura mater was pushed into this opening by the brain behind, adhered firmly to the sides of the hole, and, with its outer surface, *seemed* to form that part of the internal lining of the sac, which filled up the aperture in the ethmoid bone. In this part of the internal lining, or dura mater, and towards the right side, there was an irregular aperture, by which the inside of the sac communicated with the fluid, on the outside of the right hemisphere of the brain.

" The brain was next removed altogether from its containing cavity, and there were then observed about two ounces of a watery fluid effused in the base of the cranium, with vascularity of the pia mater, and numerous spots of coagulable lymph on the base of the brain,

particularly on the *pons varolii*, and the posterior part of both hemispheres of the cerebellum.

" Owing to unavoidable circumstances, several particulars of the inspection could not be ascertained. The co-existence, however, of an internal and external hydrocephalus, was determined with the greatest care; and I am certain that no communication existed between the fluid in the ventricles and that in the external tumour."

Of Hydrocephalus, combined with Spina Bifida.

This species of hydrocephalus is by no means so rare as the preceding.

The disease generally appears at the period of birth, in the form of a small brown coloured tumour, which is situated on some part of the neck, back, or loins, generally in the loins.

The tumour, which is soft and compressible, gradually becomes larger when the child cries.

After the tumour has been of a few weeks' duration, it often becomes of a purple colour at its top; after which it bursts, and discharges a good deal of a limpid fluid. There have been many instances of this description, in which the tumour has repeatedly burst. It afterwards acquires more of a fleshy consistence, and is to the touch somewhat hard.

When the tumour ceases to burst, the head begins to expand, the fontenelles are elevated, and the component bones of the skull are, in some instances, disjoined.

Patients in this situation generally lose their sight, but they retain their hearing: they also lose the power of moving the extremities.

When the head is elevated, the tumour in the back becomes more tense; and, on the other hand, when the head is lower than the rest of the body, it is relaxed.

A surgeon, whose child fell a victim to this form of hydrocephalus, communicated to my Father the subsequent narrative:

" The child was born December 23. 1799, and died 29th January 1804.

" When born, the head was evidently enlarged. There was a livid spot on the loins, which, on being pressed, felt very soft, as if a part of one of the vertebrae was awanting.

" The pulse was rather above the natural standard.

" His intellects were not in the least impaired; on the contrary, he was much quicker in his conceptions than most children of his age, and the light never seemed to be in any way offensive to him.

" His limbs did not grow in proportion to the rest of his body, and he had but little use of them.

" For some time before death he had occasionally diarrhœa, to relieve which, it became necessary to give him opium every night."

It may be proper to add, that MAGENDIE discovered that the fourth ventricle communicates with the spinal cavity *.

* " Je donne donc comme une disposition anatomique constante et facile à vérifier que le quatrième ventricule communique librement avec la cavité spinale sous arachnoïdienne: la communication est établie par une ouverture arrondie placée entre les deux artères cerebelleuses postérieures, et qui a de deux à trois lignes de diamètre. Je l'ai vue plusieurs fois beaucoup plus grande encore: La partie supérieure et latérale est formée par les nombreux vaisseaux sanguins de la pie mère, qui se rendent au cervelet et aux plexus choroïdes de

CONCLUSION.

FROM what has been stated, it follows, in the first place, That an effusion of water takes place between the membranes within the ventricles, or at the base of the brain, and that this effusion is various in point of its seat and extent, which depends in some measure upon the situation of the effused fluid, and that the external and internal hydrocephalus may be co-existent.

2d, That the water effused is sometimes as clear as the purest spring water, but at other times turbid, and mixed with shreds of coagulable lymph, passing through it in different directions.

cet organe. Latéralement, et au-dessus des vaisseaux, ce trou est formé par la partie interne de la cauve cornée médullaire qui borde sur les côtés et en bas le quatrième ventricule. En bas il est terminé par le bec de la plume lui-même.

" Pour voir cette overture dans sons intégrité, il faut ouvrir le canal vertébral dans la parties cervicale, enlever le crâne dans la moitie postérieure, et enfin inciser avec précautione la dure mère et l'arachnoïde qui passent du crâne au rachis. Alors en soulevant doucement le cervellet, on voit distinctement le trou. Quelquefois cependant il est encore caché par les deux artères inferieures du cervelet qui viennent s'adosser vis-à-vis ; il faut dans ce cas écarter les deux vaisseaux et l'overture apparoit aussitôt.

" Et comme le quatrième ventricule communique directement avec e troisième par l'intermédiaire du canal, nommé aqueduc des *Sylvius*, et que la troisième est en communication avec les latérax au moyen de la petite ouverture ovalaire pratiqueé sous chaque pilier anterieur de la voûte, il en résulte, cet autre fait remarquable, qu'il existe un communication directe autre le liquide du rachis, et toutes les cavités internes du cerveau."—*Journal de Physiologie, pour Janvier* 1827.

3d, That an effusion of water within the brain is to be imputed to various causes, of which a derangement in the circulation of the blood through the brain is probably the most frequent.

4th, That inflammation of an acute or chronic kind is not essential to the effusion of a fluid, though it sometimes has preceded that effusion; and that the membranes of the brain are the most common seat of the inflammation. My experience does not enable me to determine whether the inflammation be limited to a spot, or whether it extends over the whole brain. The febrile state which accompanies this inflammation varies in degree, and does not invariably correspond with the extent of the inflammation. The acute hydrocephalus has been supposed to be consequent only to inflammation of the brain, but, if that opinion be adopted, it is necessary to admit, that that inflammation does not invariably give rise to any peculiar symptoms, or that the inflammation ceases as soon as the water has been effused, as water has been detected within the ventricles of the brain, when before death, there had existed none of the symptoms of such an effusion.

It may be added, that water has been occasionally effused at the period of birth, when there is no reason to suppose that an inflammation had preceded the effusion, and also when the skull has not been found to be unusually thick or vascular; when it has not adhered very intimately with the dura mater; when that membrane has not been thickened and redder than usual, and has not been coated with lymph; when the arachnoid coat has not been thickened, opaque, nor of the colour of opal; when the pia mater has not been thickened; and when

the substance of the brain has been in its healthy state. If inflammation be admitted to be the only cause of hydrocephalus, it is probable it differs in different cases in its extent and seat; hence the sight only is impaired in some cases; while, in other instances, the breathing and sound of the voice are much affected.

5th, That the effusion of water takes place rapidly, when the cause producing it is in full operation, as when death has been occasioned by suspension, or by exposure to intense cold.

6th, That a softness of the brain may occur without any degree of previous inflammation of that organ. I have found it so in criminals, who had forfeited their lives to the violated laws of their country, when in the full enjoyment of health; and I may also mention, that the brain has been observed to be soft in cases of apoplexy, palsy, epilepsy, and mania, in which, according to Dr CULLEN and other distinguished authors, there is no idiopathic or primary pyrexia.

7th, From what has been above observed concerning the symptoms of hydrocephalus, it seems to me that these may be explained upon the principle of the distention of the arachnoid membrane lining the ventricles of the brain, and the pressure made on that organ.

There are two arguments which seem at first sight hostile to this opinion; the one, that patients have laboured under the usual symptoms of hydrocephalus, when a very small quantity of water has been found, after death, within the ventricles of the brain, in which

case, the pressure may probably have been owing to blood accumulated within the veins of the brain.

Another argument against such an opinion is, that water has been found within the ventricles of the brain after death, when there were no symptoms during life of its existence, which may be owing to the slow and gradual manner in which the fluid has been effused; beside, negative instances cannot invalidate the evidence of general observation.

In support of the opinion I have maintained, it may be observed, that partial compression of the brain gives rise to symptoms of irritation, as vomiting, fever, and convulsions. If it be admitted that the pressure of the extravasated blood be the cause of apoplexy, it appears to me that the pressure of the effused water is the cause of the symptoms of hydrocephalus, in the same manner as the pressure occasioned by the serous fluid which has been effused in cases of serous apoplexy, is the cause of the symptoms peculiar to that disorder.

The case above quoted from MORGAGNI, at page 19, is a proof that pain and irritation are occasioned immediately by distention of the ventricle.

Another circumstance in favour of such an opinion, is the relief which is given by tapping the brain.

Sir E. HOME, Dr TRAILL, and Mr BROWN*, have related cases in which water was repeatedly drawn off by puncture, and always with relief, "and temporary retention of sight, and faculty of attention, but it ultimately ended fatally."

That the symptoms proceed from pressure, seems to me to follow from the circumstance, that the lives of

* Medical and Physical Journal, vol. xii. p. 102.

many oxen and sheep have been saved by the extraction of hydatids from the brain. A shepherd informed me that he had saved ten out of fourteen sheep that he operated upon.

The effects of pressure upon the brain are very obvious, after a portion of the skull has been fractured and depressed, and even when that pressure is made through the medium of the dura mater. Pressure also impairs sensibility, when made through the medium of the ventricles, as in spina bifida combined with hydrocephalus. By pressing on the tumour in the back, so as to force up water into the ventricle, or by putting the head of the patient lower than the rest of the body, so that the water flows upwards, the sensibility is impaired, but returns as soon as the pressure upon the tumour is removed, or the head of the patient is higher up than the rest of the body.

The very striking coincidence between the results of the experiments of PORTAL, and the symptoms of hydrocephalus seem to be very strong evidence that the symptoms of hydrocephalus are to be imputed to the influence of pressure upon the brain.

These experiments were made on dogs; a hole was made in the skull, to which a funnel was adapted, which was filled with water or mercury, so as to occasion a graduated compression on the brain. The animal ceased to bark, and was much convulsed upon the pressure being increased. Still greater pressure produced profound sleep, the convulsions ceased, and the breathing became stertorous.

Dr COOKE, in his valuable observations on Palsy, page 87, observes, "Sir ASTLEY COOPER has been kind enough to give me an account of an experiment which

he made upon a dog, with a view to ascertain what degree of pressure the brain could bear, which in part confirms M. PORTAL's experiment. He trepanned a dog, and detached the dura mater in a circle from the inner table of the skull, to the extent of half an inch. He then pressed upon the dura mater, so as to depress it about the fourth part of an inch, and the dog exhibited no signs of uneasiness. He then pressed upon it to half an inch of depression, and the animal showed great signs of uneasiness, endeavouring to escape from his grasp with all his efforts: he then passed to three quarters of an inch, and the animal became torpid, breathed laboriously, and, according to the declaration of Mr DAVIE, who assisted him in the experiment, the pulse became slow and irregular. Suddenly he removed the pressure, and in half a minute the animal started from the table, turned several times round, as if giddy, and then staggered away."

That the symptoms of hydrocephalus arise from pressure upon the brain, and that this pressure occasions death, seem to follow from the sudden death consequent to the effusion of water at the base of the brain, the most sensitive part of that organ. The effect of the pressure of water in such a situation, cannot be eluded by the expansion of the membranes, or disjunction of the bones at the base of the skull; to which is to be taken into account, that water or a tumour so situated, must compress not only a very sensible part of the brain, but also those nerves, which are essential to the performance of the most important functions of the animal economy. The rapid effusion of water into the ventricles generally proves fatal in two or three weeks; but, on the other hand, when slowly and gradually effused, the expansion of the

lateral ventricles keeps pace with the effusion, the symptoms are much more moderate, and the disease is protracted.

The relief given by the expansion of the ventricles is but temporary; as the ventricles can only be extended so far as to contain ten, or at most twelve, ounces of water, if the bones of the skull do not give way.

If the component bones of the skull be separated from each other, still farther room is given for the accumulated water; and thus the urgent symptoms occasioned by the accumulated fluid are again alleviated for a time, and in a few instances for ever.

In the progress of hydrocephalus, the intervals of relief are shorter, as the water already collected within the ventricles compresses the veins proper to the membrane which lines the ventricles of the brain, the great vein of GALEN, and also the velum interpositum: thus water is more speedily effused than at first, unless there be a considerable disjunction of the bones of the skull; and this I conceive to be the reason, why infants born with hydrocephalus seldom outlive the disease above two or three years.

In the usual progress of hydrocephalus, the more severe symptoms repeatedly occur, even after the bones have been disunited, and they are removed by the still further expansion of the ventricles of the brain, and by the still further disjunction of the bones of the skull; but as the bones of the skull cannot be separated beyond a certain degree from each other, owing to the completion of the ossification upon the membranes uniting these bones, hence from the still further accumulation of water, the symptoms of oppressed brain again occur, and death follows. That the symptoms are ow-

ing to pressure, may also be inferred from the observation of MORGAGNI: "That when water has been accumulated within one only of the lateral ventricles, the patient refers the pain which he suffers in his head to that side;" and also, from the circumstance mentioned by Dr LOADE, whose patient referred the acute pain in his head to the back part of it, where the cerebellum was compressed, not only by water, but also by a quantity of purulent matter below the tentorium.

8th, If the distention in teething creates such violent symptoms, it may be inferred that the distention of the ventricles by water may produce similar effects.

9th, That after a certain quantity of water has been accumulated within the brain, that organ is not only extended, and partially absorbed, but also condensed. This latter circumstance I have repeatedly noticed when a large quantity of water had been accumulated within the brain; and if it had not been condensed, and thereby rendered more firm in texture, the thin and delicate laminæ of the septum lucidum could not have been extended to such a degree, as in the specimen from which Plate III. was taken.

I have also remarked, that the distance from the fore to the back part of the septum lucidum has been increased, when water has been accumulated for some time within the ventricles of the brain, and it has been, at the same time, rendered so tough, that it might be rudely handled without tearing.

In the same manner, the cerebellum, as a whole, has been pressed nearly flat by the accumulated fluid, or one side of it has been diminished in bulk by compres-

sion partially applied, a circumstance which was very evident in the case treated by Dr LOADE.

Water accumulated within the ventricles of the brain has sometimes flattened the thalami nervorum opticorum; as in a case which I lately saw with Dr CULLEN.

It may be further observed, that the brain may be artificially compressed into a smaller bulk by being placed under the exhausted receiver of an air-pump.

Professor LESLIE condensed the brain in this manner, and assured me that the pressure did not exceed the thirtieth part of that of an atmosphere.

The brain must be condensed or absorbed in part when the ventricles of that organ have been considerably expanded, and when there is no disjunction of the bones of the skull.

10th, From what has been above stated, it follows, that on some occasions a tolerably accurate opinion may be formed as to the seat of the water from the symptoms which have preceded death.

Thus the symptoms characteristic of water effused at the base of the brain, accompanied by an inflammation of the pia mater around the connections of the eighth pairs of nerves with the brain, are very decided and well marked.

According to MORGAGNI *, very acute pain is felt on one side of the head, when water has been lodged within one of the lateral ventricles of the brain.

In the case so ably described by Dr LOADE, the patient during her life suffered very acute pain in the back part of the head, the seat of the accumulated purulent matter.

Dr ABERCROMBIE has described the very acute and

* Epist. xii.

deep-seated pain, which accompanies the inflammation of the deeper parts of the brain. When a tumour has been situated in the third ventricle, or so as to press upon the tractus optici, the gradual loss of sight, and consequent stupor, indicate the seat of the tumour, as in the subsequent striking case, which I lately examined along with my friend Dr CULLEN.

A young man (Oct. 20. 1827) had amaurosis of both eyes. Pupils much dilated, and did not contract on exposure to intense light. No headach, nor palsy of his limb, but had great muscular debility. Intellectual faculties weak, and his memory was impaired, and he seemed remarkably stupid. Tongue covered by whitish fur, and was very tremulous when protruded. At the outset of his disorder he suffered from headach, for which he was bled and blistered, but without relief. During a paroxysm of pain, he suddenly lost his sight in a great measure, and in a few days became blind. Leeches were applied to the temples repeatedly, and purgatives were freely administered, but to no purpose. In the course of three weeks, he became delirious, which was removed by blistering the head and by powerful purgatives, as the bowels were very torpid. His general torpor and stupor increased, and he died in the course of ten days.

Dissection.—Skull and dura mater adhered intimately; inner surface of skull rough. Dura mater more vascular than usual, and there was a thin cartilaginous substance between its laminæ. Left ventricle contained ℥iij. of pure serum; and the anterior and inferior cornua were much distended. The corpus striatum was stretched and expanded. Septum lucidum was elongated. The fornix occupied its usual place, and was firm

in its texture, but not raised. The passage of communication between the lateral ventricles was filled up by a yellowish substance. On further examination, a tumour was found filling up the third ventricle: it was composed of a cheesy soft substance, of a yellow colour, and tuberculated. The right lateral ventricle was also enlarged, and contained ʒiij. of serum. When the base of the brain was examined, the above tumour was found seated in the floor of the third ventricle; it therefore pressed upon the optic commissure, and on the termination of the tractus optici, which were flattened and broader than usual. Three small cysts filled with serum were found in the back part of the posterior lobe of the right hemisphere of the brain.

The case which has been published by Dr LATHAM* affords an additional illustration of the preceding remarks. The patient had fixed pain in the back of her head; her walk was unsteady and tremulous. She was relieved by an abscess having formed in the arm-pit; the pain, however, returned when it healed, with increased severity. From two o'clock in the morning to two o'clock in the afternoon she suffered excruciating agony; lay with her eyes closed, the eyebrows contracted, hands clenched, and head immovable.

These symptoms somewhat remitted as the disease advanced, the paroxysms were frequent, and after fourteen months' suffering, she died.

Upon dissection, a tumour was found growing from both lobes of the cerebellum, and which descended, within the dura mater, into the spinal canal, as far down as the organ of the sixth pair of nerves.

* Medical and Physical Journal, July 1826.

Dr POWEL * has described the case of a man who had excruciating pain in the fore part of his head, which extended to the right side of the head, and in the course of six weeks he became blind; and after the lapse of two months he was seized with apoplexy, which proved fatal in two days.

On dissection, a tumour was found growing from the lower part of the anterior lobe of the brain, which was filled with pus. The tumour was interposed between the optic nerves, which were separated from each other. The pituitary gland was much enlarged.

Dr CLERK † has published a remarkable case, in which a man suffered acute headach when lying on his left side. After some months, his pupil became dilated, and his sight was much impaired. This was followed by vertigo, stiffness of the limbs during the paroxysms, and acute pain of his neck, and the head was drawn backwards.

On dissection, a hard tumour, two inches long, and an inch and a half broad, was found firmly attached to the tentorium cerebello superextensum, and imbedded in the posterior lobe of the brain. Two ounces of serum were found within the ventricles of the brain, and the dura mater was destroyed where it was compressed by the tumour, and also the corresponding part of the occipital bone.

But, on the other hand, tumours have been found within the brain, or connected with its membranes, which, until within a few hours before death, had not given rise to any previous symptoms, though it was evident upon dissection, from the size and consistence of the tumour, and

* Medical Transactions, vol. v.

† Edinburgh Medical and Physical Journal, vol. vi. p. 275.

the morbid state of the parts in the vicinity of it, that it existed for a considerable time within the head.

It is difficult to give a satisfactory explication of such facts. Perhaps they admit of an explanation upon the supposition of an absorption of part of the brain keeping pace with the formation and increase in the bulk of the tumour; but as soon as that equipoise is destroyed, the more urgent symptoms take place, to which is to be taken into account the effect of additional excitement in inducing suppuration in the centre of the tumour, and of disease of the brain, which sometimes has been observed around the tumour, and which probably is the consequence of it.

11th, From what has been already stated, it is evident that effusion of water has frequently taken place within the head, and even where there has been very considerable organic disease in the brain, without having given rise to any one marked symptom. In a very remarkable case of disorganization of one hemisphere of the brain, which has been published by Dr DUNCAN junior, the consequence of a fall on the head, "there were no symptoms of mental affection, inflammation, or palsy." Dr DUNCAN has added to the case the following ingenious reflections:—

"The circumstances in this case most deserving of notice are, the severity of the symptoms immediately succeeding the accident, their subsequent remission, with the exception of the blindness, which gradually increased, and the extensive disorganization of the brain observed in the body.

"Whatever was the cause of the intense headach which immediately succeeded the accident, whether the indirect debility, the consequence of intoxication; or

that greater degree of the same affection produced by concussion; or mechanical injury, it disappeared for a time, for he had been free from headach for some time previous to admission, and had even attempted to return to his work. It is probable that the immediate effects of the injury were quickly succeeded by active inflammation of the hemisphere, which had terminated in suppuration before the remission of the headach, for the dry pus found in the preternatural cavity in its substance, was evidently not of recent formation; and after his admission into the hospital, there were no symptoms of inflammation to be observed.

"The gradual increase of the blindness may be accounted for on the supposition of increasing pressure from the effusion of fluid, but its sudden commencement immediately after the injury suggests the possibility of some rupture or effusion at the time.

"Notwithstanding the considerable quantity of fluid found in the right ventricle, and the total disorganization of the left hemisphere, there were no symptoms of compression except the blindness, and none of inflammation except the pain and some thirst. The only affection of his mental faculties was partial loss of memory, and increased irritability of temper, while his functions were scarcely at all affected. He had no muscular paralysis. He slept well for a person in such agony of pain. He had a very good appetite, and digested well. His bowels were not immoderately costive. Urine natural. Pulse and respiration perfectly natural, and yet this nearly healthy state of his organic and animal life was found to co-exist with the manifest disorganization of almost all the medullary substance of the left hemisphere of the brain.

"Is the medullary matter of less importance to the due performance of the functions of the brain, than the cortical? Supposing the brain to be a double organ, why are its functions unimpaired when one organ is affected? Is the affected side cut off from all communication with the *sensorium commune?* Why, in this case, was no difference to be perceived in the muscular powers of the two sides of the body?*"

12th, From what has been stated, it appears that the functions of the alimentary canal are much deranged by effusion of water within the head, and forms, in some instances, the most prominent symptoms of the disease. Many illustrations of this proposition might be adduced in addition to those above stated.

I shall add one more instance†, that of a medical gentleman, who, during many years, had been affected by all the symptoms of indigestion. His symptoms were imputed to a deranged state of the liver, in October 1815.

The following year he was much afflicted by acute headach, and derangement in the functions of the stomach; almost every kind of food was rejected by vomiting. During the autumn, he had twice slight convulsion, and on the 9th October he died convulsed.

Upon dissection, four ounces of water were found within the brain; and there was an encysted tumour, about the size of a walnut, in the under part of the left lobe of the cerebellum. The abdominal bowels were sound.

* Edinburgh Medical and Surgical Journal, vol. xvii. p. 324.

† Medical Repository, vol. vii.

Dr SCOUTETTEN of Metz * has published some ingenious observations on the remarkable sympathy between the pia mater and the mucous membrane of the alimentary canal.

According to his observations, all the parts of the alimentary canal do not sympathize to the same extent with the coverings of the brain. He supposes that there is a greater share of sympathy between the stomach and smaller intestines and the brain, than between the great intestines and the brain. He has also stated, that when the mucous membrane of the stomach, or small intestines, is inflamed, that the vessels of the pia mater are distended with blood, so as to form red patches, which is sometimes followed by extravasation: and he supposes, that this view of the subject is calculated to explain many of the phenomena of apoplexy;—thus, from the violent excitement of the stomach being communicated to the brain, there is an increased determination of blood to that organ;—thus the bloodvessels are gradually weakened, and thereby more apt to be ruptured.

13th, That there is a diversity of opinion amongst authors as to the cause of the formation of tubercles in the brain. Dr ALISON shewed me a specimen of the tuberculated lungs of a rabbit, which disease he produced by irritating the lungs with quicksilver poured into the branches of the windpipe; and hence he infers that tubercles are occasioned by inflammation; whereas LAENNEC and ANDRAL junior entertain a contrary opinion.

14th, That tumours are sometimes accompanied by softening of the brain,—that tumours of different de-

* Journal Universel des Sciences Medicales, Decembre 1822.

scriptions have frequently been found connected with the membranes or substance of the brain, of which tubercles, or albuminous tumours, are the most frequent; —that these tubercles are similar, as to size, appearance and structure, to those tubercles which are found on the lungs, liver, spleen, mesentery, and other parts of the body, varying in size from that which is as small as a pin's head to that which is equal to the size of a chesnut;—that such tumours grow from every part of the brain and cerebellum, and not unfrequently at the same time that similar tubercles have been found in the thoracic or abdominal viscera.

15th, From what has been stated, it is obvious that hydrocephalus owes its rise to a variety of causes, several of which cannot be obviated by human skill; hence the disorder frequently proves fatal.

Lastly, That tapping the brain has not proved a cure for hydrocephalus chronicus in any case treated by British surgeons. Many instances are recorded in which the brain has been tapped three, four or five times, but the disease has invariably returned (excepting in the case stated by Rossi), and proved fatal.

The tapping, however, has afforded temporary relief in all the instances which have fallen under my notice, with a single exception, in which death took place in the course of sixteen hours after the operation.

APPENDIX.

APPENDIX.

After the preceding sheets were printed, I received the following important communication from Dr Kellie of Leith.

"*Extracts from unpublished Notes and Observations on Tubercles, and on the Effects produced by these formations on the different textures and organs in which they are found.* By George Kellie, M. D. F. R. S. E., &c.

"I am persuaded, from much observation, that the common tubercle may be formed, attain a considerable size, and long exist in all the structures, and in every organ of the body, without occasioning much or any sensible disturbance of the functions of the viscus in which the formation has been taking place. When, indeed, these formations become excited and inflamed, when they soften or suppurate, or when they excite and disorganize the structures which they inhabit, the case is very different, and trains of morbid symptoms are produced, even suddenly in some cases, more characteristic, however, of the injured function of the matrix of the tubercles, than indicative of the existence of the parasite formations themselves.

"I have found tubercles in the serous membranes, and imbedded in the substance of the liver, of the spleen, of the kidney, of the uterus, of the lungs, of the brain, and of the cerebellum, in subjects in which no symptoms had indicated their existence during life. In young people, in children especially, from five to ten or twelve years of age, it is not uncommon to find tubercles of various sizes, and in various states of progression, co-existing in all or most of the organs in the same subject, who had enjoyed perhaps good, or very tolerable health, till within a very few days of his death. I found them in the

brain, in the lungs, and in the peritoneum, of one boy of seven years of age; in the brain, in the medulla oblongata, in the liver, in the spleen, and in the lungs of another boy at the age of nine; and yet these boys were active and well, and continued at school till within fourteen days of their death. Both died of Hydrocephalus acutus, passing, in the course of fourteen days, through all the stages of that disease, with nosographic regularity. In the latter boy, there occurred, indeed, during the last two days of his existence, a paralysis of the right side, and a spastic rigidity of the left arm, which enabled me to conjecture the probable existence, not of tubercles, but of inflammation and softening of the substance of the brain, as well as of the distension of the ventricles by serous effusion. Accordingly, besides the dropsy of the ventricles, I found two tubercles, each of the size of a garden-pea, hanging pendulous from the tentorium, two others of the same size in the medullary substance of the right hemisphere, and one oblong tubercle, of the size of an almond, suppurated in its centre, and imbedded in the pons varolii.

The cerebral tubercles were spherical, firm, grey-coloured, and encysted, having but a very loose, if any connection with the cerebral substance. The tubercle found in the medulla oblongata, which was softened and suppurated in its centre, could not be turned out from its nidus in the pons, with which it was firmly united. There were found also numerous tubercles in the lungs, liver, and spleen of this subject *. Yet this fine boy, till attacked with headach, fever, and vomiting, about a fortnight before his death, was not only to all appearance free from disease; he was active also, diligent, and considered a clever boy at school. I doubt not, therefore, that these tubercles, even those of the brain, had been formed, and had even long existed, without any obvious disturbance of the subject's health, and without materially deranging the functions of those organs in which they were lodged. I have met with other similar

* I was assisted in this dissection by Dr Combe, and I have preserved the preparations for the museum of the Royal College of Surgeons.

cases, but the following places this conclusion beyond the possibility of doubt.

On the morning of Thursday the 2d of August, about half-past eight o'clock, I was requested to visit, as speedily as possible, a boy of the name of Bell, residing in Poplar Lane, who had a little before been suddenly attacked with violent convulsions. When I arrived, the convulsive struggle was over, but there was still an occasional subsultus of the muscles of the face and of the arms. He was insensible and comatose; the pulse was very rapid, and the heart was striking against the side with remarkable violence. My inquiries were answered to the following effect: That his age was six years; that he had been upon the whole healthy, never had a convulsive fit before, was not liable to headaches, though he was to coughs ever since he had had measles; that he was in perfect health, in so far as could be discovered on Tuesday; that he had taken his food that day, and had amused and occupied himself as usual, going to bed at the usual time without complaint; that, on Wednesday morning, when dressing, he complained for the first time of pain of the loins, and of that only; that, continuing to do so, and seeming listless and unwell, his aunt had, towards noon, given him a dose of epsom salts, which operated four or five times, but without relieving him; that, on the contrary, though he kept out of bed all day, he complained more and more of the pain in the back and loins till night; that, towards eleven, he fell asleep, but frequently awoke and complained of this pain, and at length, towards three this morning, he seemed to suffer so much, that Mrs Nichol, a midwife, residing in the same quarter, and an intimate of the family, was called to assist him; that she administered an enema, and observing what she called a great working about the breast, she applied two leeches to the sternum; that the excruciating pain of the back continued unabated; that he complained incessantly, and was extremely restless till eight o'clock this morning, when the convulsive attack supervened.

Six ounces of blood were instantly taken from the arm;

another enema was then administered, and a purgative powder was directed to be given in a spoonful of gruel, so soon as the patient recovered the power of swallowing.

But he never recovered his sensibility. The spasmodic twitchings of the muscles of the face and arms continued to recur at short intervals; and at half past noon there came on another general convulsion, which continued, with little abatement, till one o'clock, when he died.

Next morning the body was examined. The general appearance of the corpse was that of a well-grown boy of his age. The medulla spinalis, to which my attention was first directed, on account of the excruciating pain complained of in the back and loins, very carefully examined in its whole length, exhibited no trace of disease in its substance, its membranes, or its vascular system. The spinal nerves were equally sound.

In the cerebrum I found three tubercles, and in the cerebellum one. Of those discovered in the brain, one the size of a small chesnut was found adherent to the arachnoid of the dura mater, and buried in the substance of the convexity of the posterior lobe of the left hemisphere, from which it was withdrawn along with the dura mater, on raising that membrane in the usual way from the cerebrum.

When the softened cerebral substance torn from the brain by the removal of this tubercle was washed off from it, the tubercle itself, of the size and shape nearly of a chesnut, appeared somewhat nodulated on its surface: it was very firm, of a greyish colour, and invested by a membranous cyst, having evident vascular and membranous connections with the arachnoid, and with the brain. Other two tubercles were found, one in each hemisphere of the brain, imbedded in the medullary walls of the lateral ventricles in corresponding situations, a little above and between the corpus striatum and thalamus of either side. These tubercles were spherical, of the size of small cherries, of a reddish colour, and exceedingly firm. Each was invested with a cyst having membranous, flocculent and vascular processes, shooting from it into the medullary substance of the

brain, and entangling, in removing the tubercle from its situation, softened portions of that substance. The left hemisphere of the cerebellum was much softened; and in the midst of the defluent mass, there was found an oblong tubercle, of the size of the largest almond, invested with the same kind of membranous flocculent cyst, and having the same colour and firmness as the other tubercles. I divided this tubercle, and one also of the smaller spherical tubercles, in order to examine their internal structure. The section presented an exterior, reddish, highly vascular circumference, penetrating the tubercle to the extent of a line, and a central portion of the lightest grey colour, and having, as well as the external reddish portion, the firmness and consistence nearly of cartilage. But the difference of colour remarked between the circumference and the central portion of the tubercles was lost by a few days' maceration.

The medulla oblongata, and the membranes and vascular system of the brain, exhibited no change of structure; and there was but little of serous effusion discovered in the ventricles, in the cavity of the arachnoid, or at the basis of the brain. In the chest there was found a slight adhesion of the right lung to the pleura. There were no tubercles. The bronchial glands were large and strumous. The heart and its vessels were of the natural structure; all the abdominal viscera were sound *.

I consider this case as a very remarkable one; for though I know from this, and from other examples, that tubercles may exist in the brain for a long while, without very obviously disturbing its functions, I have not met with any other case in which a fatal crisis has so suddenly occurred at the early age of this boy.

In young people, the more common termination of such cases is by consequent arachnitis and hydrencephalus; and in adults, by inflammation and softening of the substance of the brain.

* In the dissection of this very interesting case, I was assisted by C. Cheyne, Esq. Surgeon in Leith. The tubercles are preserved for the Museum of the College of Surgeons.

THE following extracts from Professor BURNS's Principles of Midwifery, 6th edition, London, 1824, contain his sentiments as to the effects produced by irritating the extremities of the 5th and 8th pairs of nerves, and which are referred at page 70.

" Injurious effects may also be produced by irritating the extremities of important nerves, whereby the origins of these nerves are not only affected, but also the parts in the vicinity of these origins, and the nerves which come off there are irritated, or the whole encephalon may, more or less, and in varying degress, be affected. This is exemplified by the effects of irritation of the nerves of the jaw in dentition, or of the intercostal and par vagum in abdominal affections. These are two of the most important nerves of the body, and are intimately connected with the basis of the brain, and spinal marrow, and also with one another, both anatomically and in function. The 8th pair of nerves, so important to the stomach and thoracic viscera, arises from the very base of the brain, from the medulla oblongata, and corpora olivaria. It communicates with the intercostal and cervical nerves, and its recurrent, as well as the laryngeal nerve it gives off above, have a most important influence on the larynx *."

" The effects produced on the brain, or its appendages, by these causes, may, perhaps, be referred to the following heads. 1st, A moderate degree of excitement, or irritation, producing a febrile state, with or without spasmodic affections, or distant pain, or uneasy sensations. 2d, Pain referred to the head, or spasms and pain in other parts, without fever, or extreme sensibility of some organ of sense, with susceptibility of mental emotion. 3d, A higher degree of irritation, inducing inflammation. 4th, A loss of vigour or action in part of the brain or its appendages, producing a corresponding injury in the parts dependent thereon, such as weakness, anathæsia, palsy, &c. This has too often been attributed to pressure; but pressure only produces this state, which may exist without it, as we see in

simple concussion, or some diseases to be soon noticed. 5th, Apoplexy. 6th, As secondary consequences of some of these states, we may have suppuration, serous effusion, torpor, or extreme susceptibility, change of structure, occasioning, in its turn, new symptoms *".

* Page 707.

EXPLANATION OF THE PLATES.

Fig. 1.

Fig. 2.

Fig. 3.

P. Syme del.

PLATE I.

FIG. 1.

REPRESENTS a large Hydatid *b* inverted, in order to shew the manner in which these animals are propagated, viz. by the adhesion of the young to the inner surface of the larger Hydatid. It may be observed from the annexed engraving, that, in certain places, the smaller Hydatids are collected into distinct clusters, as at *a*, *a*.

FIG. 2.

Represents a cluster of very small Hydatids, which were imbedded within the choroid plexus,—a section was made into the tumour to shew its structure: It consists of a congeries of small hydatids. Vide *a*.

FIG. 3.

Represents a Scrofulous Tumour, which was situated over one of the lateral Sinuses. It was taken from the body of a child that died from Hydrocephalus acutus, whose case has been particularly described at page 49.

a, *a*, The dura mater
b, The scrofulous tumour.
c, One of the lateral sinuses.

PLATE II.

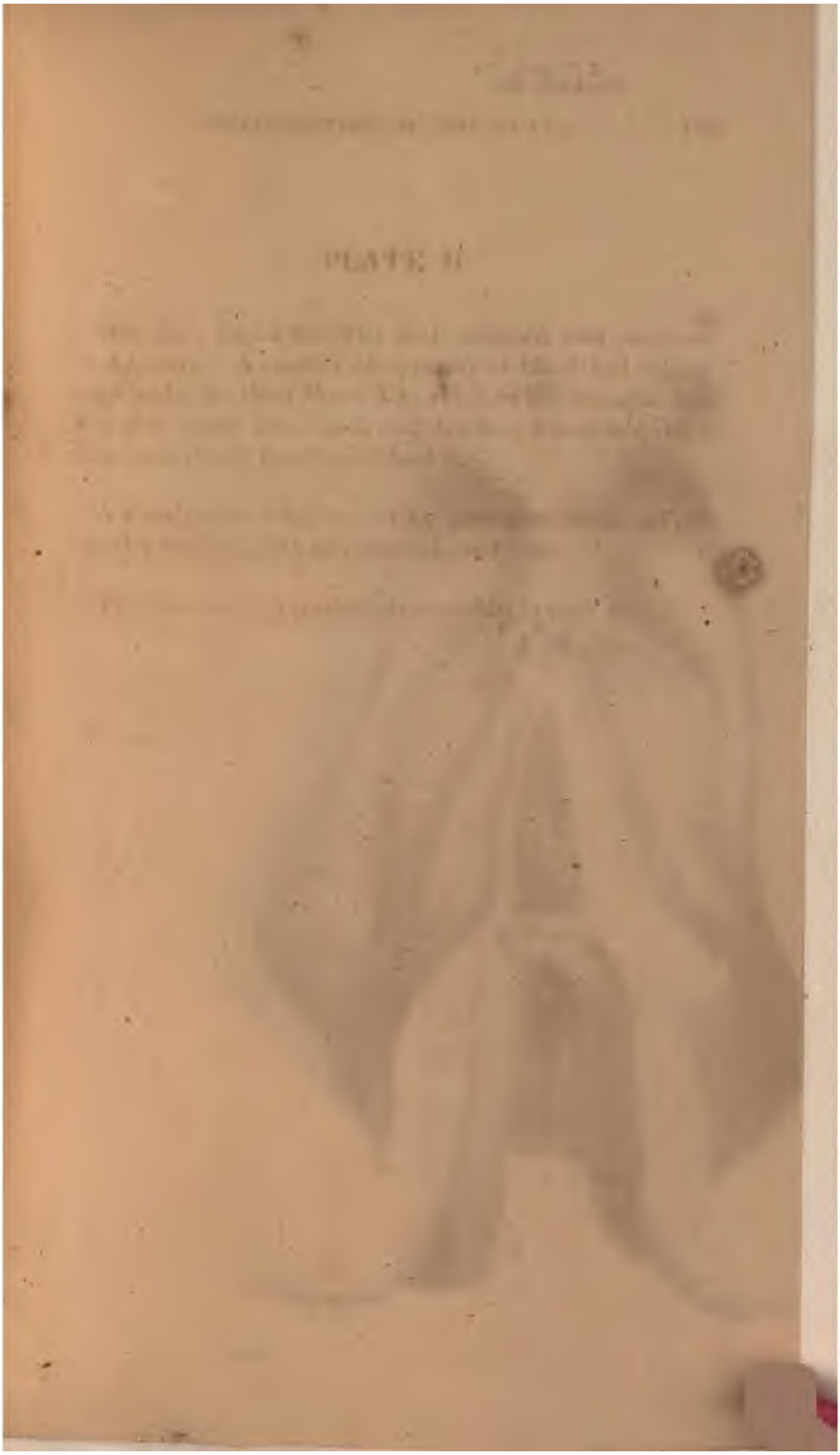
PLATE II.

Was taken from a man who died suddenly, with symptoms of Apoplexy. A considerable quantity of blood had been effused under the Dura Mater AA, which, in this case, was more of a pink colour than usual, and has been raised, in order to shew more clearly the effused blood B.

A Canal, marked by letters CD, pass downwards, and contained a small quantity of yellow coloured Serum.

This case has been particularly described at page 13.

PLATE II



a
c
g
a
i
e
d
a
W. Miller Sc.

PLATE III.

Gives a very excellent view of the two Lateral Ventricles, of the fifth Ventricle, and also of the fourth.

The Lateral Ventricles were very considerably distended and distorted by a fluid, and, in a particular manner, the fifth Ventricle; and it may be observed that the walls of that ventricle were of a much firmer texture than usual, otherwise they could not have been extended in the manner which is represented in this engraving, which is very faithful to nature, and which was taken from an excellent drawing of my late pupil Dr CHARLES GREVILLE.

The history of this case will be found at page 17.

a, a, a, b, b. The hemispheres of the brain.
c, The anterior cornu of one of the lateral ventricles.
d, The posterior cornu of one of the lateral ventricles.
e, f, The distended portions of the lateral ventricles.
g, h, The corpora striata.
i, The tenia semicircularis.
k, Thalamus nervi optici.
l, Anterior part of the fornix.
m, The fifth ventricle, much enlarged.
n, A section of the cerebellum.
o, The fourth ventricle laid open.

PLATE IV.

PLATE IV.

Figure 1st was taken from the Brain of a young woman, who had received a severe blow upon the head, in consequence of a ladder having fallen upon her.

She was at the moment stunned, and suffered acute headach for several days, which was succeeded by nausea and sickness.

After the lapse of six months, a tumour, about the size of a small pea, appeared behind the right ear, and this gradually increased in size.

In the course of the following month, she began to squint, and the pain in her head became still more acute; the tumour behind the ear became still larger, but she did not suffer pain, though it was compressed.

The following month, her pupils were dilated, and she became nearly blind; at the end of the month she could not distinguish day from night.

The above mentioned symptoms became still more urgent, so that she was never free from sickness or headach, with the additional symptom of very acute pain over her eyes. The tumour gradually increased in size, sometimes there was a distinct fluctuation in it, and at other times no fluctuation could be perceived.

The pain in her head, especially over her eyes, became so very acute that she often screamed aloud.

The tumour, which was now about the size of a billiard-ball, was to the touch much harder than before.

The tumour became larger, and in figure resembled the half of an orange; she never had any pain in it when compressed. She was now harassed by vomiting, and nothing remained on her stomach but wine and water, and a little toasted bread. She lived in extreme agony for five months longer, or in all five years from the period she received the blow on the head.

She lost her hearing, soon after which she fell into a state of stupor, and died comatose.

Upon examining the tumour, which was placed over the connection of the parietal, temporal and occipital bones behind the right ear, it was found that it consisted principally of a cartilaginous substance, that it was intersected by several bony plates, and contained a very small quantity of a serous fluid.

The skull opposite to the tumour adhered very firmly to the dura mater.

Upon examining the skull with attention, it was found to be carious, opposite to the tumour, and that there were several erosions, and in particular a large one through both tables, at the fore part of which the brain and external excrescence were united. Several other parts of the cranium were very thin and transparent; and, besides, there were two tubercles (Vid. Plate, G, G) on the lateral part of the right lobe on the cerebellum. The dura mater was much thickened and inflamed, and from it there grew three or four small and irregular excrescences. The convolutions of the upper part of the brain (Vid. letter A), on the right side of the head, were manifest; but the rest of the surface of the brain was very uneven, ragged, and pulpy. When this soft portion was put into spirits, it formed a fluid of the consistence of cream. There was a very hard tumour, of the size of the two fists, of a very irregular figure, having several knobs projecting from it, which consisted chiefly of cartilage, with an admixture of bony substance in its centre, in the substance of the opposite hemisphere.

Mr Howship has described the case of a lady, who, when fifteen years of age, received a slight blow on the right side of the head, which occasioned for thirty years severe headach at the seat of the injury. At fifty, she died comatose. At the seat of the injury, the skull was very thin for the extent of a crown piece. The dura mater was removed at this place, and the brain beneath it was a dark livid colour, *and much indurated*, and the disease extended through the middle lobe.

The preceding case affords a very striking illustration of the extent of disease of the brain. Dr ABERCROMBIE was so polite as to furnish me with the following case, in which there was a very extensive destruction of the substance of the brain.

"It seems," to employ Dr ABERCROMBIE's own words, "to have been originally a tubercular mass, mixed with some masses of an albuminous character, and at last terminating by some extensive ramollissement. When we consider the extent of the disease, and the state of health of the patient a few hours before death, it is probably almost unique in the history of diseases of the brain, and shews us, in a very striking manner, the imperfection of our knowledge in regard to the symptoms arising from cerebral disease.

"A young lady who, between her 14th and 17th years, had suffered considerably from chronic ophthalmia, was attacked in her 18th year with paralysis of the face. The mouth was twisted to the right side; the orbicularis of the left eye was affected, so that the eye could not be shut without a great effort; the sight of that eye was much impaired, and there was numbness of the whole left side of the face; the pulse was natural. The affection had begun with a pain referred to the left ear. She was bled generally and topically, and freely purged, and the affection disappeared in six or eight days. Some time after she had a second attack of the same kind, which also subsided in the same manner. After this she became liable to attacks of giddiness, accompanied by indistinct vision, and followed by vomiting. These attacks were of frequent occurrence, but did not in general continue above a day or two, and in the intervals she was in perfect health. These symptoms went on for about a year. In her 19th year, while she was one day sitting at dinner, she suddenly fell from her chair in a state of complete insensibility, with general muscular contraction or rather rigidity, but without convulsion; and in this state she remained for nearly two hours. This occurred in the month of June 1822, and there was no recurrence of the attack till December following, when she had one exactly similar. A third took

place in February 1823; and a fourth in June of the same year. From the first occurrence of these paroxysms, the attacks of giddiness became more distressing, and were then for the first time accompanied by headach, which was chiefly referred to the left temple and the left ear; and the attacks were often followed by thin watery discharges from the ear. After the fourth paroxysm of the comatose affection, she began to have indistinctness of vision. At this period she used sea-bathing, by which the headach was increased, and the indistinctness of vision passed into a considerable degree of amaurosis. For the latter affection, an emetic was now recommended to her, the operation of which was immediately followed by a violent attack of the paroxysm of insensibility, and this continued to recur at short intervals to the time of her death. The period of their occurrence, according to the account of her friends, was, that, for a fortnight, they attacked her generally every day, and for the next fortnight she was entirely free from them. They continued to exhibit nearly the same characters as formerly described, namely, insensibility, with muscular rigidity; and there never was any appearance of convulsion, except in one instance, during the whole course of the disease. The attack generally continued from half an hour to an hour; and except the imperfection of vision, her general health was so good, that she was married in February 1824, which was about two months before her death. At this time she first came under the care of my friend Dr Ross, to whom I am indebted for the preceding history; and the leading symptoms then were, frequent recurrence of the paroxysms of insensibility, with violent headach, accompanied by giddiness and sickness. There was a great degree of amaurosis, but the pulse was natural, and her health in other respects good. Under the use of extract of stramonium, the paroxysms were now suspended, the vision was very much improved, and her general health and spirits were such, that the evening before her death was spent cheerfully with a party in the house of a friend. She returned home about eleven o'clock at night, and went to bed apparently in her usual

health. About eight o'clock in the following morning she was found in a state of insensibility, with rigidity of the body; she was supposed, by her friends, to be in one of her usual attacks, but when she was seen by Dr Ross, a short time after, he found that she was dead. I was present at the examination of the body.

"*Inspection.*—The brain externally appeared healthy, but when a thin section was cut from the upper part of the left hemisphere, a cavity was exposed, through which a probe passed in every direction without any resistance, through nearly the whole extent of the hemisphere. This, upon farther examination, was found to arise from the whole hemisphere being in such a remarkable state of decomposition or softening, that it formed one great cyst, full of soft pultaceous matter, inclosed in a very thin covering, formed by the healthy cerebral matter on the surface. The healthy portion forming this covering, in many places, did not exceed a quarter of an inch in thickness; and at the thickest parts, which were on the upper surface of the brain, did not exceed one-half or three-fourths of an inch. The contained matter was a thin soft pulp, mixed with portions of a pellucid albuminous substance, which coagulated when they were thrown into boiling water. This matter was chiefly in irregular masses, but there were some firmer portions of it, which could be separated in the form of distinct round nodules, resembling hydatids. On examination, however, they were found not to be hydatids, but uniform masses of the albuminous matter in a more concrete state. On the external part of the hemisphere, lying over the petrous portion of the temporal bone, there was a tumour the size of a pigeon's egg adhering firmly to the inner surface of the dura mater. Externally, it was irregular, as if formed of a congeries of smaller tumours; internally, it was composed partly of a reddish soft flesh-coloured matter, and partly of a semipellucid albuminous substance, in nodules of various degrees of firmness. When thrown into boiling water, the whole mass assumed a uniform opaque white colour, and a hard cheesy consistence. The left ventricle

was entire; it contained a small quantity of serous fluid, and was separated from the diseased mass by a very thin septum. The right hemisphere was healthy, except on the inner part of the anterior lobe, which was considerably softened. It appeared to every one who witnessed the dissection, that the left hemisphere had been considerably enlarged, and the right diminished in the same proportion, the falx being sensibly pushed towards the right side. The optic nerves seemed softer than natural; the cerebellum was healthy."

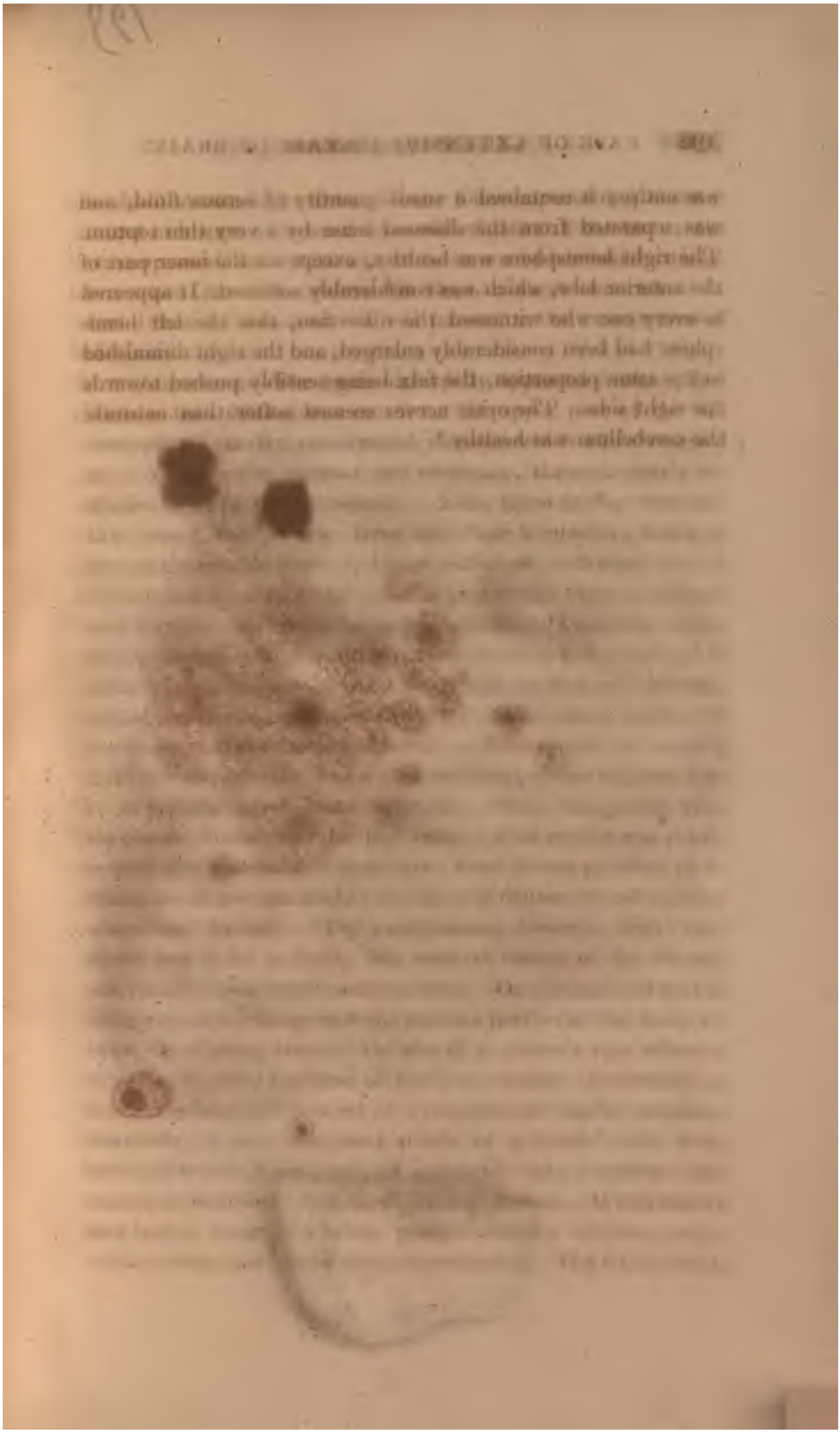


PLATE V.

PLATE V.

Figure 1st represents a very large tumour, of a cartilaginous consistence, which I removed from the head of the same patient as Plate IV.

This tumour is very remarkable on account of its very great size. The engraving is rather more than a third smaller than the original.

It is very irregular on its surface, and is composed of the aggregation of a number of smaller tumours of different sizes, as is apparent, not only from the inspection of the outer surface of the tumour, which is represented in this Plate, but still more so in the section of the tumour.

Towards the centre of the tumour, there is a small quantity of bony matter, and there were a number of small cysts, of different sizes and forms, filled by lymph.

The upper part of the tumour adheres to the dura mater, marked by the letters A, A, A, from the upper surface of which several small tumours, B, B, have grown, which are of a similar consistence with the larger mass.

Fig. 2. represents several small tubercles of the brain. I am indebted to that excellent pathologist and surgeon Mr WATSON for the original drawing, and also for the subsequent history of the patient from whose brain the drawing was taken.

April 25.—M. R., ætat. seven and a half, affected with drowsiness, loathing of food, vomiting every evening, accompanied with feverishness and occasional flushing of face, and pain of head. Skin hot and dry,—pulse quick,—tongue pretty clean,—pupils dilated,—had got powders with calomel, to open his bowels.

For several months previously, when she came home from

school, she was observed to loathe her food, and to lay down her head. She had become much emaciated; and been confined to bed for three days.

Leeches,—cold,—and blisters were applied to her head. Diaphoretic purgative,—mercurial and diuretic medicines were given, but without much benefit. The pulse became slower.

May 2.—Was seized with convulsions. Leeches and a blister were again applied, by which she seemed to become better for two or three days, but the pulse became quicker, sometimes intermitting. Convulsions returned on the 6th, and she died on the 8th May.

Inspection.—Upon removing the dura mater, several clusters of small whitish tubercles were seen under the pia mater, on the upper part of the right hemisphere of the brain. On cutting into the substance of the brain, particularly on the right side, small tubercles were found imbedded, here and there, throughout both its medullary and cineritious parts. These tubercles were, for the most part, single, though some were in clusters. They were about the size of millet-seeds, and of a semicartilaginous appearance. There was more than two ounces of limpid fluid in the ventricles of the brain. The cerebellum was studded with the same sort of tubercles, and was rather softer than natural.

The lungs, liver, and mesentery, were each affected with tubercles of the same description.

END OF VOL. I.

CORRIGENDA.

Page 51, lines 14 and 16 from the bottom, *for* substances *read* substance
— 67, line 7 — — *for* eleven *read* eight
— — — 8 — — *for* sixty-two *read* forty